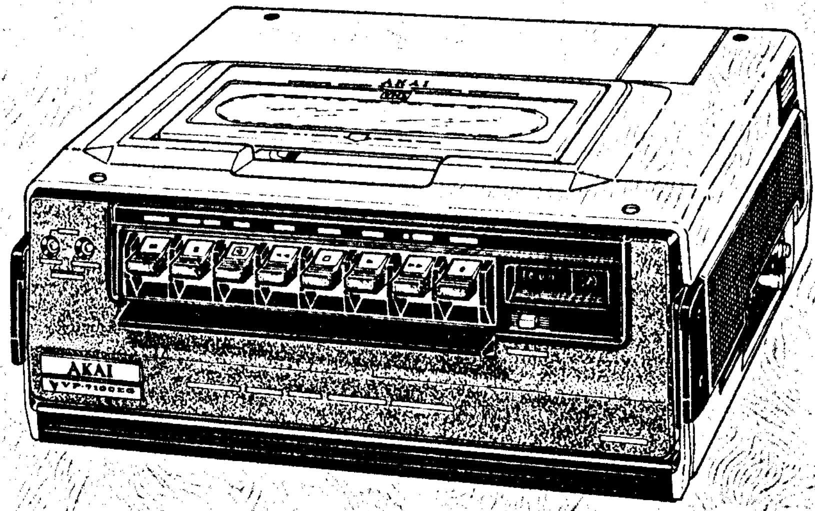
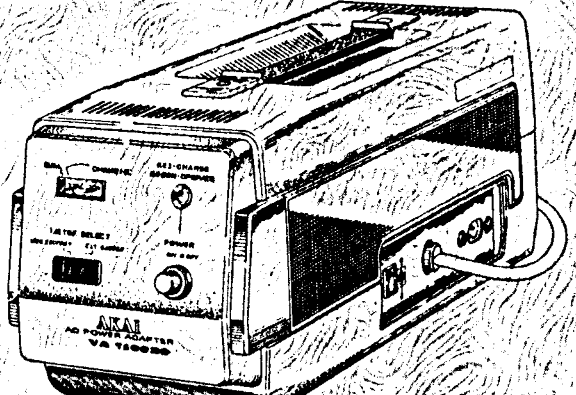
VP-7100EG/EK
VA-7100EG/EK

AKAI SERVICE MANUAL


AKAI
VP-7100EG


POWER
AKAI
AC POWER ADAPTER
VA-7100EG

PORTABLE VIDEO CASSETTE RECORDER
MODEL VP-7100EG/EK

AC POWER ADAPTOR
MODEL VA-7100EG/EK

SECTION 1

GENERAL DESCRIPTION

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1-1 INTRODUCTION

This manual provides service information for the AKAI VHS Model VP-7100EG/EK. The manual describes the principles and adjustments of mechanical electrical operations for this model.

Service procedures given herein cover only field maintenance services.

Adjustments which require high-level instruments, jigs and techniques are excluded, since they should be performed at the factory.

Due to design modifications, the servicing procedures and data given in this manual are subject to possible change without prior notice.

VHS™

Only cassettes marked VHS can be used with this video cassette recorder.

1-2 WARNING FOR VP-7100EG/EK

WARNING: Many of the programs broadcast by television stations are protected by copyright and Federal law imposes strict penalties for copyright infringement. Some motion picture companies have taken the position that home recording for non-commercial purposes is an infringement of their copyrights. Until the cours have ruled on the proper interpretation of the law as applied to home video recording, this equipment, if used to record copyrighted material, will have to be operated at the user's own risk.

WARNING:
TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE.

This video cassette recorder should be used with 12V DC only.

CAUTION:
To prevent electric shocks and fire hazards, do NOT use any other power source.

1-3 FEATURES

- Lightweight, compact, easy-to use portable.
- Flexible 3-way power supply arrangement – battery, household AC and car battery.
- Automatic recharging of the built-in battery possible with the optional VA-7100EG/EK AC Power Adapter.
- Economical power consumption of 10 watts.
- Excellent picture equality assured by the built-in full color recording and playback circuitry.
- May be connected most TV receivers with the built-in RF converter.
- Temporary tape stops possible with the pause control.
- Audio dubbing facility provided to modify the sound track on prerecorded tapes.
- MEMORY (SEARCH) mechanism facilitates locating a particular tape section.
- Automatic switching between the camera input and the line input.
- Drop-out compensator built in to compensate f tape aberrations caused by oxide drop-out, producing clean pictures.
- Automatic switching between color and monochrome signal processing.

1-4 SPECIFICATIONS

FORMAT		VHS standard
RECORDING SYSTEM		Rotary, slant azimuth two-head helical scan system
VIDEO SIGNAL SYSTEM		PAL-type color signal, 625 lines
TAPE WIDTH		12.7 mm (1/2 inch)
TAPE SPEED		23.39 mm/s
MAXIMUM RECORDING TIME		180 min. (with AKAI E-180 video cassette)
POWER REQUIREMENT		12V DC
POWER CONSUMPTION		10 watts
TEMPERATURE	OPERATING	0° to 40°C (32° to 104°F)
	STORAGE	–20° to 60°C (–4° to 140°F)
VIDEO	INPUT	0.5 to 2.0 Vp-p, 75 ohms unbalanced
	OUTPUT	1.0 Vp-p, 75 ohms unbalanced
	HORIZONTAL RESOLUTION	More than 240 lines (color mode) More than 300 lines (B/W mode)
	SIGNAL-TO-NOISE RATIO	More than 40 dB (Rhode & Schwarz noise meter)
AUDIO	INPUT	Mic.: –67 dBs, 10 k-ohms unbalanced Line: –20 dBs, 50 k-ohms unbalanced
	OUTPUT	Line: –6 dBs, 1 k-ohm unbalanced
	FREQUENCY RESPONSE	70 Hz to 10,000 Hz
	SIGNAL-TO-NOISE RATIO	More than 40 dB
RF OUTPUT		UHF channel 32–40
DIMENSIONS		33.8 cm (W) x 13.7 cm (H) x 32.8 cm (D) (13-3/8" x 5-7/16" x 13")
WEIGHT		7.5 kg (16.5 lbs.) 9.3 kg (20.5 lbs.) including cassette*, battery pack and RF converter. (* optional)
ACCESSORIES PROVIDED		BP-L30 Battery Pack, Earphone, RF converter, Aerial cable
OPTIONAL ACCESSORIES		VS-V15 Carrying case for VP-7100EG/EK, RC-V1 Pause mode remote control switch, BP-L30 Spare battery pack

Design and specifications subject to change without notice.

1-5 PRECAUTIONS

Avoid using the VP-7100EG/EK under the following conditions:

- Extremely hot or cold places
- Near appliances generating strong magnetic fields
- Moving from a cold to a warm place
- Places subject to excessive humidity, dust or vibrations

Remember the following:

- Do not place heavy objects on the VP-7100EG/EK.
- Do not apply shocks to the VP-7100EG/EK.
- Prevent inflammables, water and metallic objects from entering the VP-7100EG/EK.
- Always keep the BP-L30 battery pack fully charged. (The battery pack will gradually discharge in storage. Always recharge the battery pack immediately after use, regardless of how much to the power has been consumed.)
- Use the VA-7100EG/EK AC power adapter to operate the VP-7100EG/EK household AC current.
- Before switching off the power switch of the AC power adapter, be sure to press the STOP key.
- Make it a rule to remove the cassette from the recorder when you are not using it. If you carry the recorder with the cassette in place and the tape engaged in the transport mechanism, the recorder might be damaged.

1-6 CONTROLS AND CONNECTORS

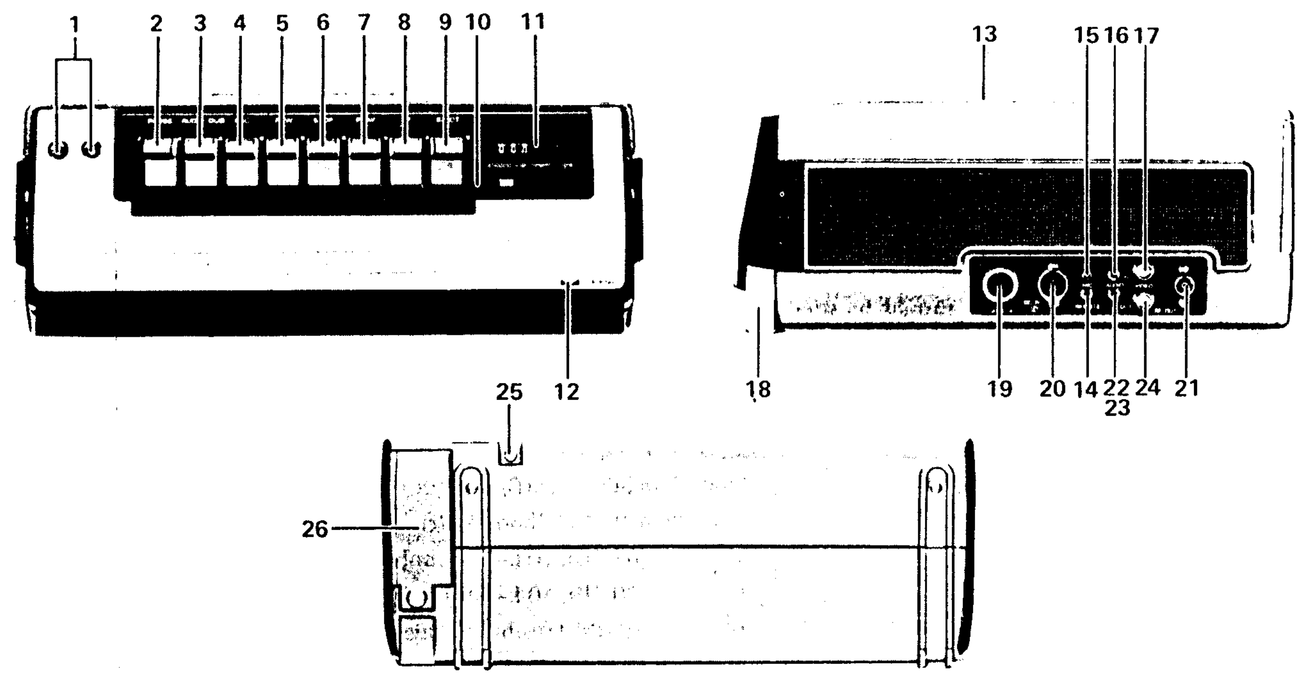

Fig. 1-1

1. **EMPTY/WARNING lamps**
   These lamps inform you by lighting or flickering when the BP-L30 battery pack installed in the recorder nears the end of its power or when moisture condenses inside the set. See subsection 1-7.
2. **PAUSE key**
   Press to stop the tape temporarily during recording or playback.
3. **AUDIO DUB key**
   Press together with the PLAY button to record the sound onto a previously recorded tape.
4. **REC key**
   Press together with the PLAY button to record.
5. **REW key**
   Press to rewind the tape.
6. **STOP key**
   Press to stop the tape.
7. **PLAY key**
   Press to play back the tape.
8. **FF key**
   Press to fast forward the tape.
9. **EJECT key**
   Press to lift the cassette holder for insertion or removal of the cassette.
10. **MEMORY (SEARCH) button**
    With this button depressed, the tape stops automatically when the counter reaches "999" in the Rewind mode.
11. **Tape counter**
    Convenient in finding the starting point of a desired section of the tape. The counter is reset to "000" by pressing the reset button.
12. **TRACKING control**
    Turn to clear the picture of noise bars, if appearing, during playback.
13. **Cassette holder**
14. **REMOTE control jack**
    The pause function can be remote-controlled by connecting an optional remote control switch to this jack.
15. **MIC jack**
    For connection of a microphone.
16. **AUDIO IN connector**
    For connection of a tape recorder, etc.
17. **VIDEO IN connector**
    Connect a video signal source other than that from the AKAI portable video camera.
18. **Carrying handle**
19. **CAMERA connector**
    Connect the AKAI portable video camera VC-7100EG/EK.
20. **DC IN connector**
    When the unit is to be powered through the VA-7100EG/EK AC Power Adapter, connect the adapter to this connector.
21. **RF OUT jack**
    The output from the built-in RF converter is available from this jack. Connect to a TV receiver.

22. **EAR jack**
    Connect the provided earphone to monitor the sound being recorded.
23. **AUDIO OUT connector**
    The audio signals being recorded or played back are available.
24. **VIDEO OUT connector**
    The video signals being recorded or played back are available.
25. **RF converter compartment**
    The RF converter, preset to UHF 36, is built in. Adjustable to UHF channels 32 through 40.
26. **Battery compartment**
    Install the exclusive BP-L30 battery pack here.

1-7 WARNING LAMPS

The VP-7100EG/EK incorporates special circuits for detecting and warning of the battery power condition and moisture condensation. If one or both of the warning lamps should light or flicker, check the following points.

If the battery power is insufficient ....
The yellow WARNING lamp lights to indicate that the built-in BP-L30 battery pack is nearing the end of its power.
Then the red EMPTY lamp lights. If the recorder continues to be used in this state, the battery pack will fully discharge and be unable to be recharged .... unusable in the future. Therefore, if the red lamp lights, immediately recharge the battery pack or replace it with another charged battery pack.

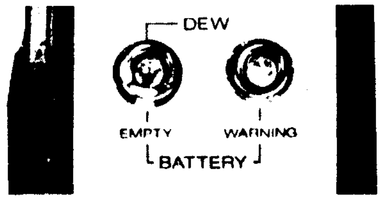

Fig. 1-2

Caution!
Over-discharged battery packs are not reusable, being impossible to be recharged. Be careful!

If moisture condenses inside the recorder ....

Moisture condensation
If you pour a cold liquid into a glass, water vapor in the air will condense on the surface of the glass. This is called moisture condensation. Moisture condensation on the head drum, one of the most crucial parts of the video recorder, will cause damage to the tape.

Moisture condensation will happen ....
- When you move the recorder from a cold place to a warm place
- After heating a cold room
- Under extremely humid conditions

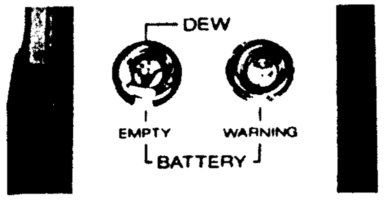

Fig. 1-3

The red lamp flickers to warn of moisture condensation.
The recorder does not function in this condition. Wait a few hours for the condensation to dry.

NOTE: The warning lamps may light briefly when you operate the control keys. This is not due to any defect in the unit.

1-8 A WORD ON VIDEO CASSETTES AND EXCLUSIVE BP-L30 BATTERY PACK

Video cassettes
Employ video cassettes carrying the VHS mark.
E-180 for 3 hours of recording, E-120 for 2 hours, E-60 for 1 hour and E-30 for 30 minutes are available.
VHS video cassettes are equipped with a safety tab to prevent accidental erasure. When the tab is removed, recording cannot be performed. If you wish to record on a cassette whose tab has already been removed, use cellophane tape to block the slot.

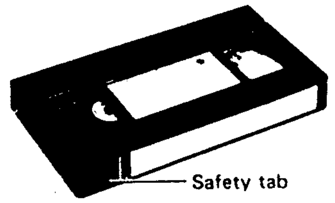

Fig. 1-4

Handling and storage of video cassettes
- Avoid exposing the cassettes to direct sunlight. Keep them away from heaters.
- Avoid extreme humidity, violent vibrations or shocks, strong magnetic fields (near a motor, transformer or a magnet) and dusty places.
- Place the cassettes in cassette cases and position vertically.

Exclusive BP-L30 battery pack

Correct use of the BP-L30 battery pack:

- The BP-L30 is a lead/acid battery, therefore, when it is used at temperatures below 5°C (41°F), its capacity may be reduced as much as half.
- The BP-L30 is rechargeable. For recharging procedures, see subsection 1-10.
- A fully charged battery pack will provide power at normal temperature of 25°C (77°F).
  - for about 3 hours when the VP-7100EG/EK is used alone (for playback), or
  - for about 1 hour when the VP-7100EG/EK is used in combination with the VC-7100EG/EK color video camera.

Be sure not to short-circuit the inner pin to the outer rim of the plug.

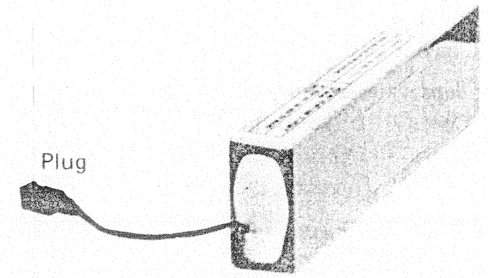

Fig. 1-5

NOTE: Even when you are not using the battery pack for a long period, do not forget to recharge it from time to time. The battery pack will discharge gradually and become unusable.

1-9 LOADING AND UNLOADING THE VIDEO CASSETTE

Loading

1. Depress the EJECT key. The cassette holder will pop up.

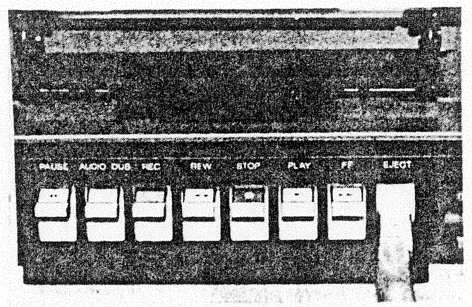

Fig. 1-6

2. Load the cassette in the proper manner as shown. An inverted cassette cannot be inserted.

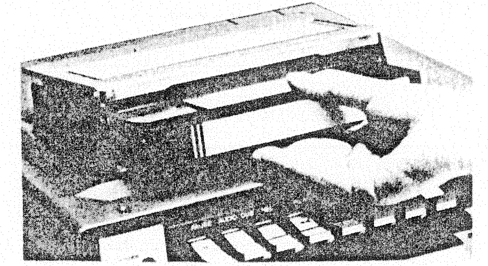

Fig. 1-7

3. Press the front part of the holder down to lock in the cassette.

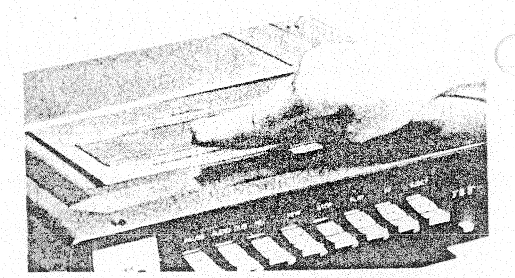

Fig. 1-8

Unloading

1. Make sure that the recorder is in the Stop mode.

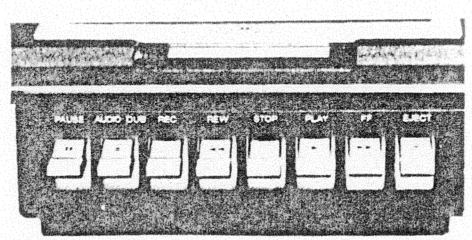

Fig. 1-9

2. Depress the EJECT key.

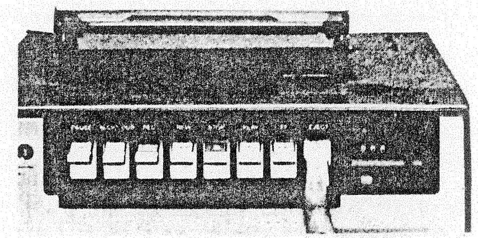

Fig. 1-10

3. Remove the cassette.

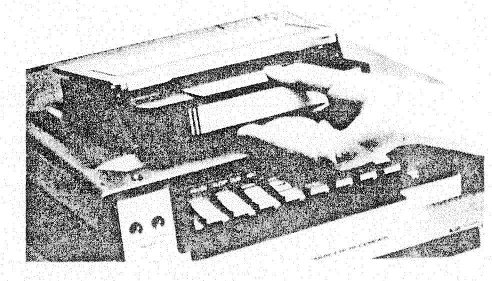

Fig. 1-11

4. Press down on the holder.

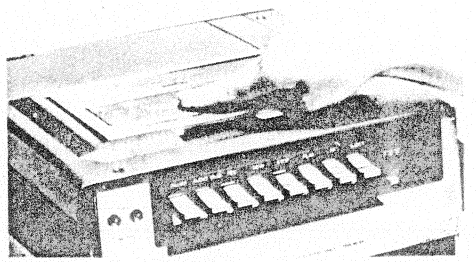

Fig. 1-12

1-10 RECHARGING THE BP-L30 BATTERY PACK

The VA-7100EG/EK AC power adapter can recharge two BP-L30 battery packs simultaneously; one installed inside the recorder and the other separate from the recorder as a spare battery.

1. Connect the AC power adapter to an AC wall outlet.
2. Connect the battery pack to the EXT BATTERY socket of the adapter.
3. When another battery pack installed in the recorder is to be recharged simultaneously, connect the DC power output cable of the adapter to the DC IN (12V) connector of the recorder. (The recorder should be in the Stop mode.)
4. Switch the adapter's power switch to ON. The power indicator will light red. (If the indicator lamp lights green, it means that the recorder is not in the Stop mode. Recharging is possible only in the Stop mode. Depress the recorder's STOP key.)

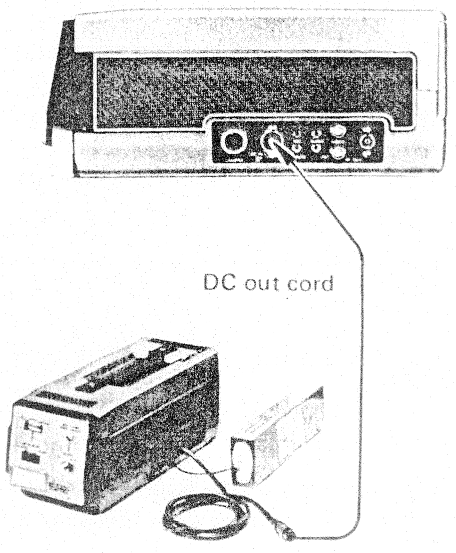

Fig. 1-13

5. Check the charging condition with the charging meter provided on the adapter.

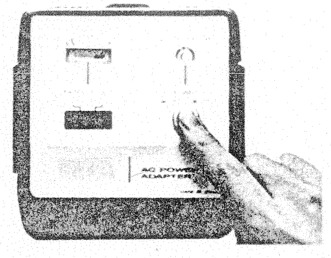

Fig 1-14

How to check the charging condition

The meter needle deflects to the right when charging starts.

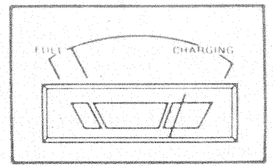

Fig. 1-15

The meter needle deflects towards the left as charging proceeds.

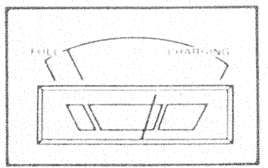

Fig. 1-16

When the meter needle points to FULL, the battery has been fully charged.

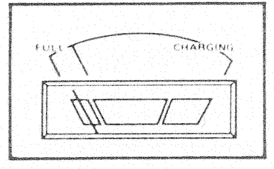

Fig. 1-17

Meter select switch
VCR BATTERY:
to check the charging condition of the battery pack installed in the recorder.
EXT BATTERY:
to check the charging condition of the battery pack directly connected to the AC power adapter.

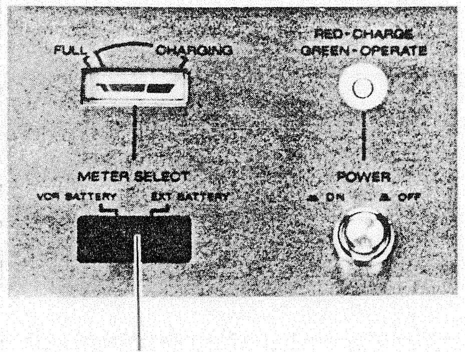

Fig. 1-18

NOTE: About 8 hours are required to fully charge the battery pack. However, it is recommendable to continue charging a little longer (about 10 – 12 hours.)

1-11 POWER SUPPLY

The VP-7100EG/EK employs a convenient three-way power supply system. Select household AC current, BP-L30 battery pack or car battery according to your specific situation.

Using the exclusive BP-L30 battery pack

1. Loosen the screw on the battery compartment cover on the rear panel of the unit and remove the cover. Then withdraw the blue ribbon.

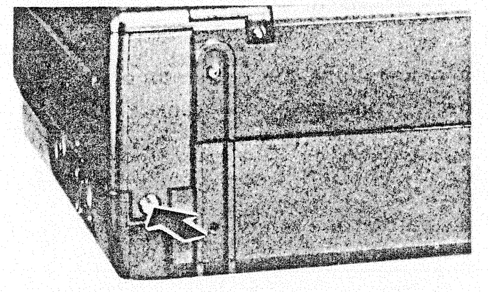

Fig. 1-19

2. Insert the battery pack with its cord forward and overlaying the blue ribbon.

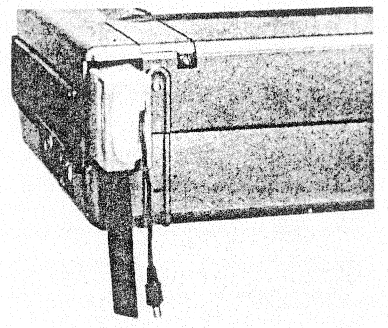

Fig. 1-20

3. Plug the battery cord into the socket near the opening and replace the cover.

   Be careful not to damage the cord and plug.

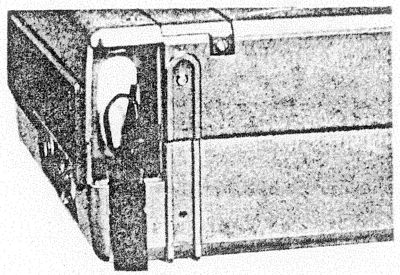

Fig. 1-21

Using household AC with the VA-7100EG/EK AC power adapter

1. Plug the adapter's power cord into an AC outlet.

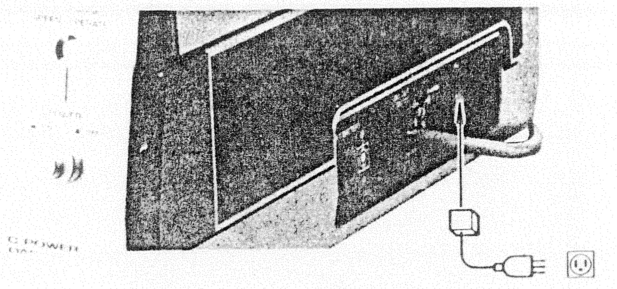

Fig. 1-22

2. Connect the adapter's DC output cord into the recorder's DC IN connector.

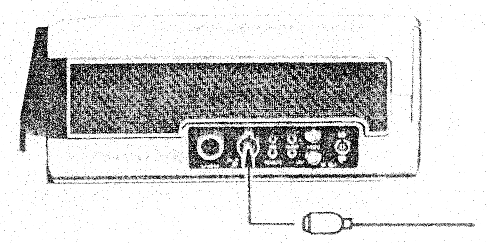

Fig. 1-23

3. Turn the adapter's power switch to ON.

   To stop power supply, be sure to put the recorder in the STOP mode first. Then turn off the adapter's power switch.

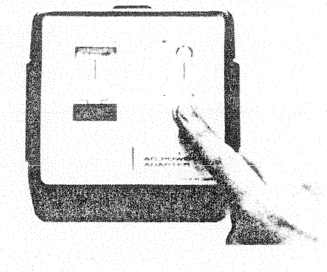

Fig. 1-24

Using an automobile battery with the VW-V2 car battery cord

1. Plug the car battery cord into the car's cigarette lighter socket.

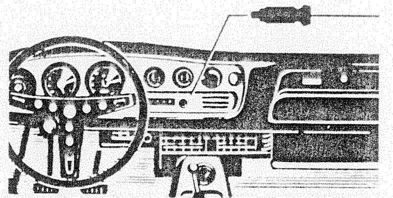

Fig. 1-25

2. Plug the other end of the cord into the recorder's DC IN connector.

   To stop power supply, be sure to put the recorder in the STOP mode first. Then unplug the cord.

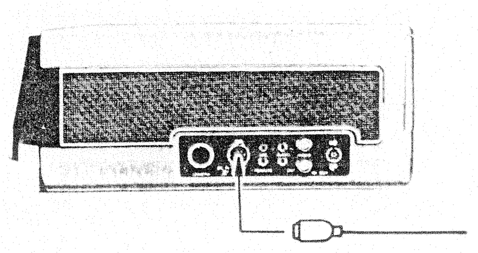

Fig. 1-26

Caution!

- Use the car battery with the engine idling or while driving the car, to avoid discharging the car battery.
- The recorder's DC in connector should be connected ONLY to cars with NEGATIVE GROUND 12V batteries.

1-12 CONNECTING TO A PORTABLE VIDEO CAMERA

The AKAI VC-7100EG/EK color portable video camera can be connected to the VP-7100EG/EK for outdoor video taping.

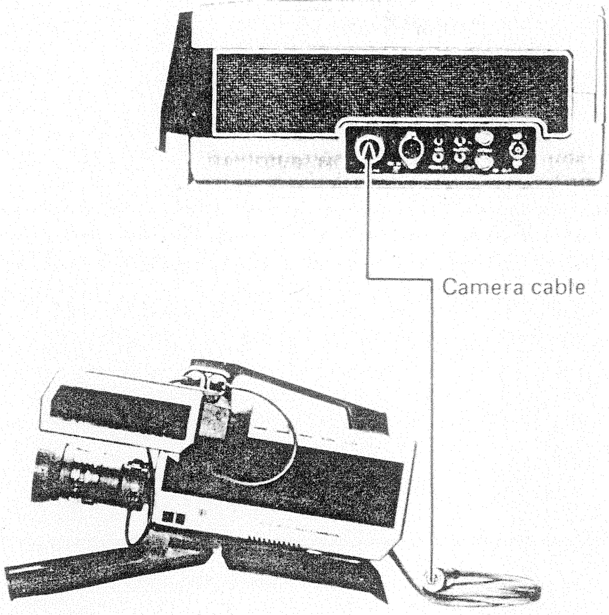

Fig. 1-27

- **Connecting to a color portable video camera**
  Connect the camera cable to the CAMERA connector of the VP-7100EG/EK.

NOTE: When a portable video camera is plugged into the CAMERA connector, all other inputs are switched off automatically. Except MIC input.

1-13 RECORDING WITH A VIDE CAMERA

1. Make preparations for power supply. (See page 7.)
2. Connect a portable video camera.
3. Insert a video cassette properly.

   Make sure that the safety tab on the cassette is in place. If it has been broken and removed, reseal the slot with cellophane tape.

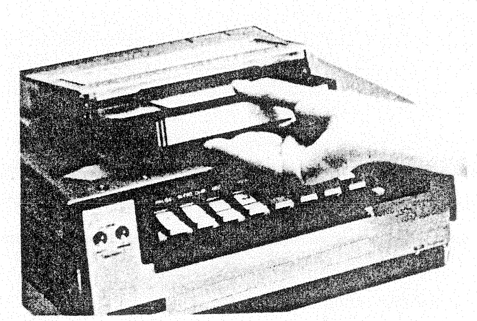
Fig. 1-28

4. Make sure that the camera's start/stop switch is in its STOP position.
   When recording with a microphone other than the camera's built-in microphone, connect it to the MIC jack on the VP-7100EG/EK, then the camera's built-in microphone is automatically switched off.

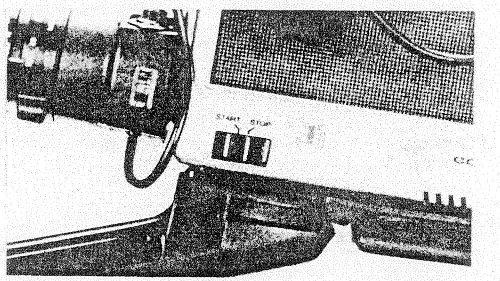
Fig. 1-29

5. Depress the REC and PLAY keys simultaneously. This also supplies power to the camera and brings both the recorder and camera in the stand-by mode in which pictures can be monitored on the camera view-finder screen without starting recording. The camera's start/stop switch must be in its STOP position.

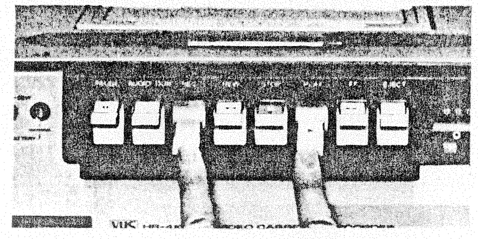
Fig. 1-30

6. Adjust the aperture, focus and composition. (For details refer to the instructions for the camera.)

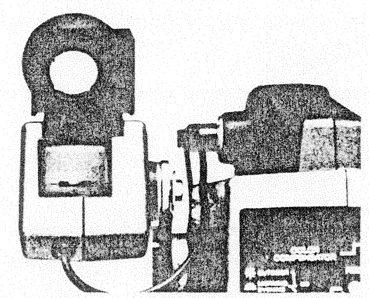
Fig. 1-31

7. Shift the camera's START/STOP switch to START. Recording will start.
   To stop recording temporarily, shift the start/stop switch to STOP to enter the standby mode.

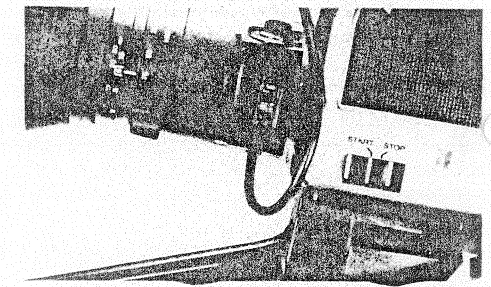
Fig. 1-32

Caution!
- Do not continue holding the standby mode for more than 5 minutes. (The battery power is consumed even in the standby mode.)
- If you are going to remain in the standby mode for longer than 5 minutes, depress the recorder's STOP key.
- If the red EMPTY lamp lights, recharge or replace the battery pack immediately.
- When several cuts are shot in succession, there may be some distortion seen instantaneously at the seams between cuts during playback.

1-14 MONITORING THE RECORDINGS THROUGH A CAMERA VIEWFINDER

1. Make preparations for power supply. (See page 7.)
2. Connect a portable video camera. (See page 9.)
3. Install the prerecorded cassette properly.
4. Rewind the tape, if necessary, by pressing the REW key. To stop rewinding, press the STOP key.

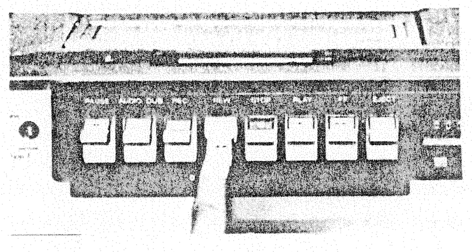
Fig. 1-33

5. Depress the PLAY key.
   This permits you to view the recorded scenes on the camera's viewfinder screen.

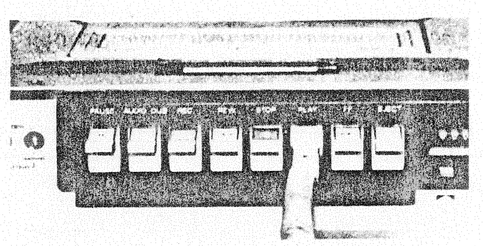
Fig. 1-34

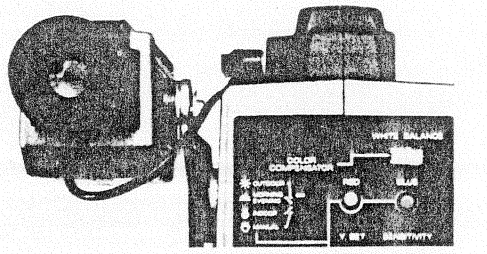
Fig. 1-35

6. If you want to monitor the recorded sound, connect the supplied earphone to the recorder's AUDIO OUT connector.

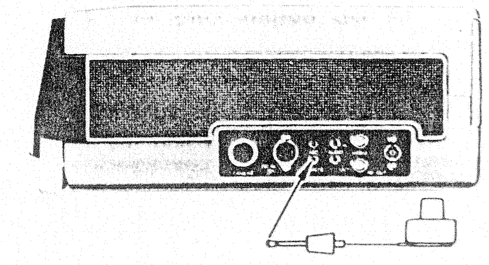
Fig. 1-36

Caution!
- If the red Empty lamp lights, be sure to stop the recorder and recharge or replace the battery pack.
- As long as the PAUSE key is depressed, depressing the PLAY key cannot start tape transport.

1-15 PLAYBACK USING A TV RECEIVER

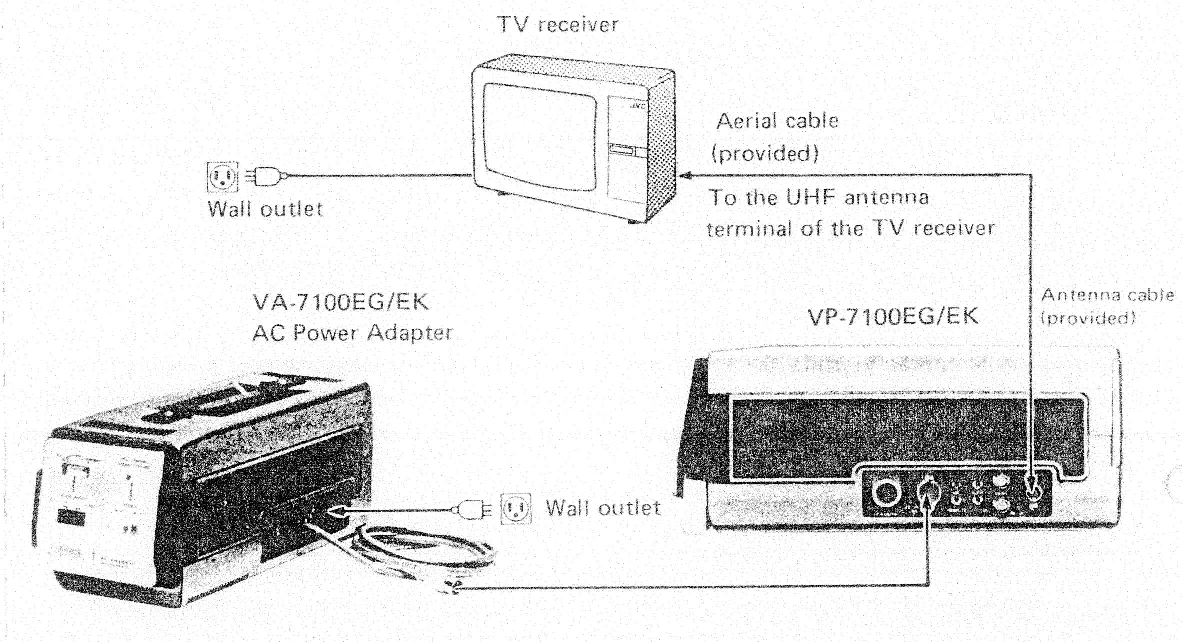
TV receiver
Aerial cable
(provided)
Wall outlet
To the UHF antenna
terminal of the TV receiver
VA-7100EG/EK
AC Power Adapter
VP-7100EG/EK
Antenna cable
(provided)
Wall outlet

Fig. 1-37

An RF converter, is provided with the VP-7100EG/EK. This converter has been set to UHF channel 36 before shipment. If channel 36 is employed for broadcasting in your area, reset the converter to one of the vacant channels between 32 and 40 using a screwdriver.

Connection

1. Connect the power cord of the AC power adapter to an AC wall outlet.
2. Connect the DC output cord of the AC power adapter's to the recorder's DC IN connector.
3. Remove the aerial cable from the TV receiver and, using the provided aerial cable, connect between the recorder's RF OUT terminal and the TV receiver's aerial socket.

Installing the RF converter

1. Remove the RF converter compartment cover.

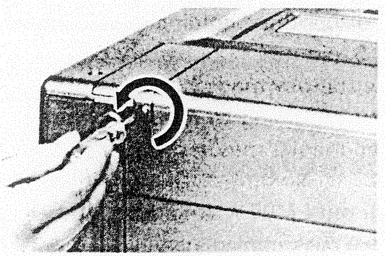

Fig. 1-38

2. Draw out the blue ribbon from the compartment and insert the converter into the compartment with the ribbon underneath.

   The blue ribbon will make removal of the converter easier.

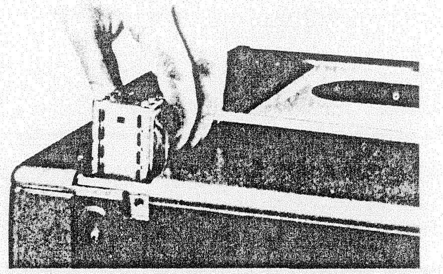

Fig. 1-39

3. Replace the cover.

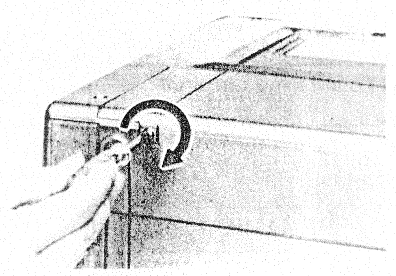

Fig. 1-40

Playback

1. Load the prerecorded cassette properly.

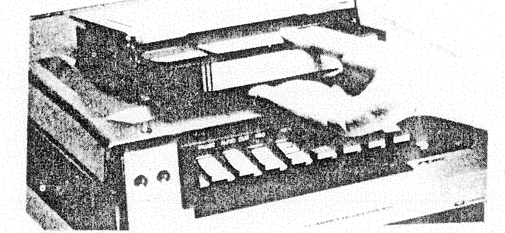

Fig. 1-41

2. Adjust the TV receiver channel selector to the same channel of the RF converter (UHF channel 32 through 40).

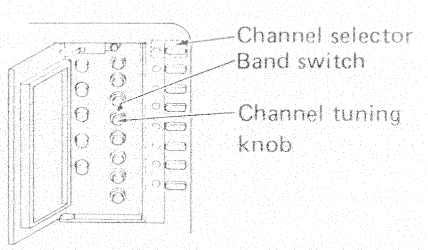
Channel selector
Band switch
Channel tuning
knob

Fig. 1-42

3. Depress the PLAY key. Playback will start.

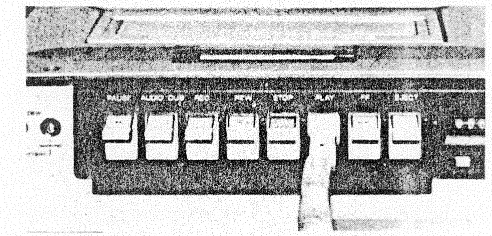

Fig. 1-43

1-16 AUDIO DUBBING

Operation

1. Turn on power for the AC adapter and TV receiver.
2. Install the RF converter as described before.
3. Set the TV receiver channel properly.

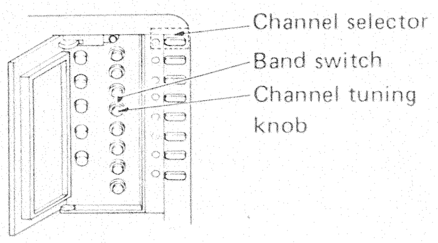
Channel selector
Band switch
Channel tuning
knob

Fig. 1-44

4. Load the prerecorded cassette properly.

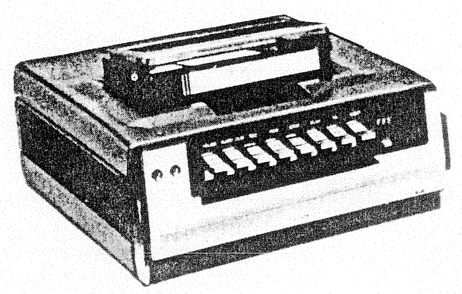

Fig. 1-45

5. Depress the AUDIO DUB and PLAY keys simultaneously.
6. While monitoring the TV screen, perform microphone recording.

   The prerecorded sound track is replaced with the new recordings.

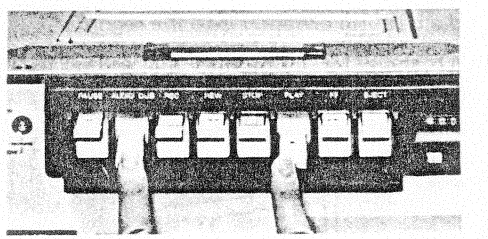

Fig. 1-46

Caution!

- **If the AUDIO DUB key cannot be depressed ....**
  Check the safety tab on the cassette. If the safety tab has been removed, audio dubbing is impossible. Reseal the slot with cellophane tape.
- **If howling is heard from the TV receiver ....**
  Turn the TV volume control down or move the microphone away from the TV receiver.

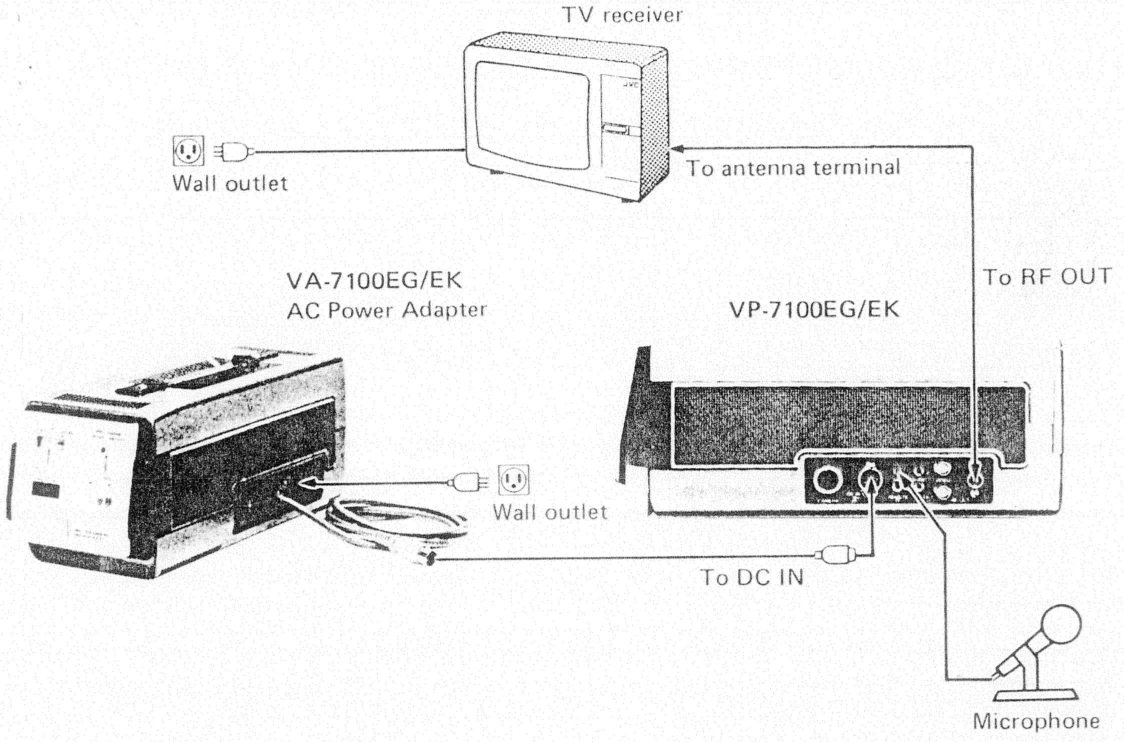
TV receiver
Wall outlet
To antenna terminal
To RF OUT
VA-7100EG/EK
AC Power Adapter
VP-7100EG/EK
Wall outlet
To DC IN
Microphone

Fig. 1-47

1-17 RECORDING AND PLAYBACK USING COLOR TV MONITOR

Recording

1. Switch the AC power adapter ON.
2. Load a cassette properly into the recorder.
3. Switch the color TV monitor ON and set its TV/VTR select switch to VTR.

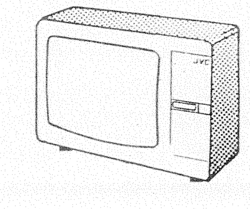

Fig. 1-48

4. Set the TV monitor channel selector to the channel which you wish to record.
5. Depress the REC and PLAY keys simultaneously. Recording will start. To stop recording, depress the STOP key.

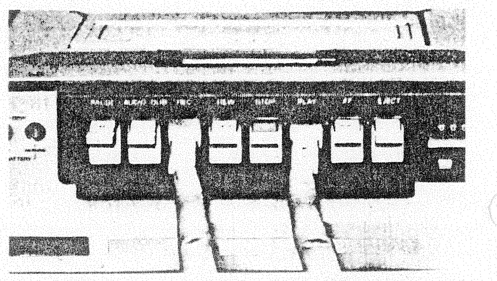

Fig. 1-49

Playback

1. Rewind the tape by depressing the REW key. To stop rewinding midway, depress the STOP key.

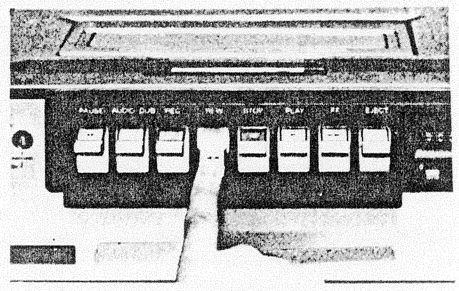

Fig. 1-50

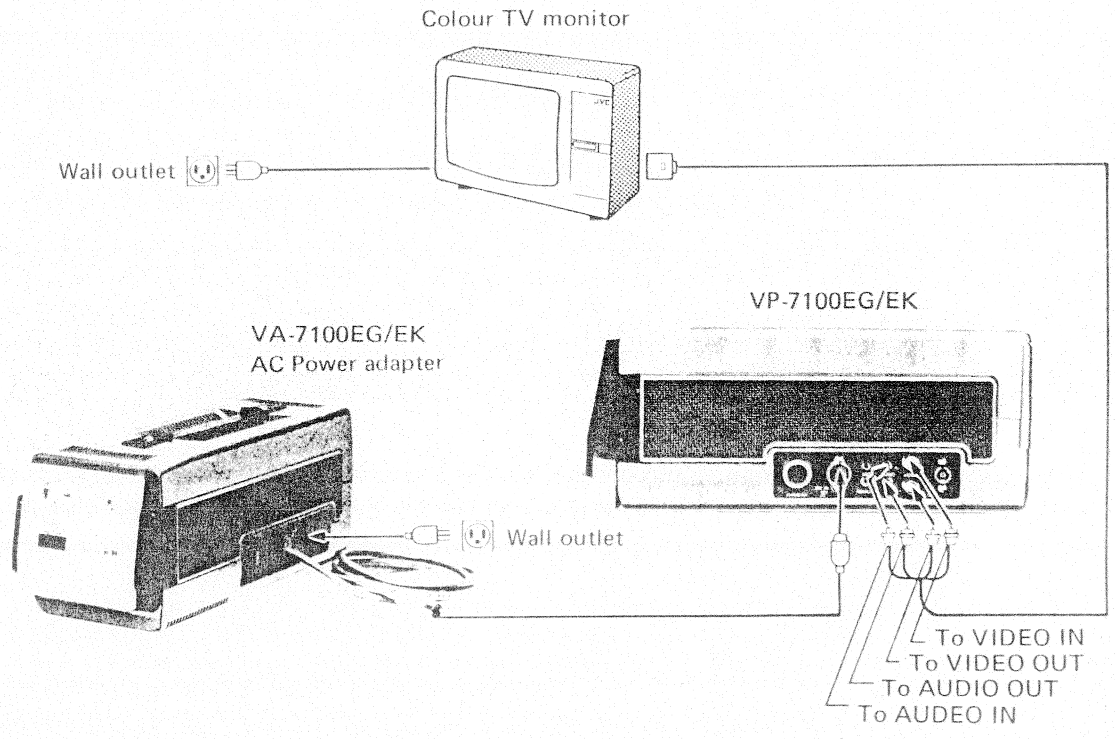
Colour TV monitor
Wall outlet
VP-7100EG/EK
VA-7100EG/EK
AC Power adapter
Wall outlet
To VIDEO IN
To VIDEO OUT
To AUDIO OUT
To AUDEO IN

Fig. 1-51

2. Depress the PLAY key. The recorded program will be reproduced on the TV monitor screen.

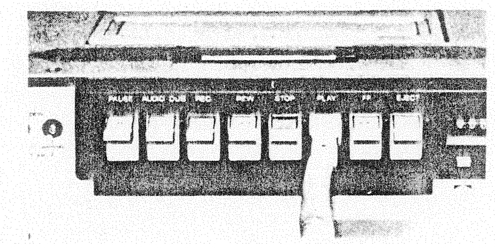

Fig. 1-52

Caution!

- The video and audio input terminals can be used only when the CAMERA connector is free. When a camera is connected to the CAMERA connector, only the signals from the camera can be recorded.
- As long as the PAUSE key is depressed, the PLAY key does not function.

1-18 CONVENIENT FACILITIES

MEMORY (SEARCH) button

1. When you start recording or playback in the middle of the cassette, press the counter reset button to reset the counter to "000".
2. To return to that point of starting after recording or playback, first press the MEMORY button for ON and then depress the REW key. The tape will stop automatically just before that point; i.e. when the counter reaches "999".

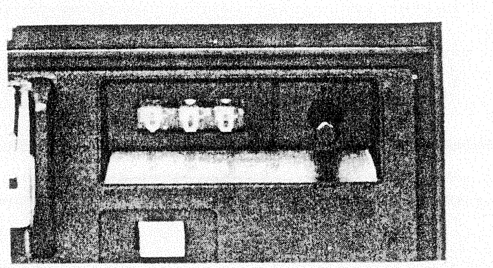

Fig. 1-53

NOTE: The MEMORY button functions only in the Rewind mode.

PAUSE key

For skipping unpreferred material:

Depress the PAUSE key if you wish to stop the tape temporarily during recording or playback.

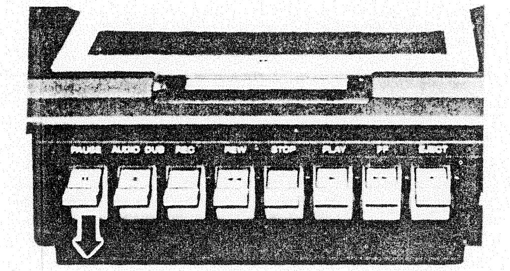
PAUSE
AUDIO DUB
REC
REW
STOP
PLAY
FF
EJECT

Fig. 1-54

Convenient for skipping commercials during recording TV programs.

For recording a program on a part of the prerecorded tape:

1. Play back the tape and locate the point from which you wish to start a new recording.
2. Depress the PAUSE key.
3. Depress the REC key and release the PAUSE key. This permits you to record the new program immediately following a previously recorded program.

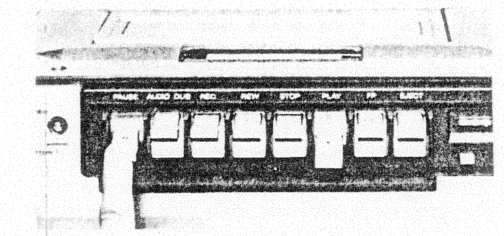

Fig. 1-55

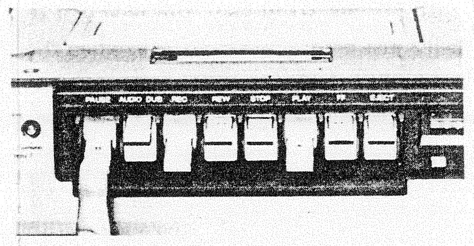

Fig. 1-56

The Pause function can be controlled with a remote control switch (optional).

NOTE: When the tape is stopped with the PAUSE key during recording, the playback picture may become distorted for a moment. However, this is normal and a clear picture will soon return.

Pause remote control

The pause function can also be controlled with the optional remote control switch RC-V1 connected to the side panel REMOTE jack.

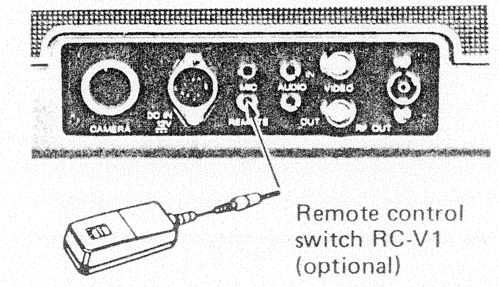
CAMERA
DC IN
MIC
REMOTE
AUDIO
VIDEO
OUT
RF OUT
Remote control switch RC-V1 (optional)

Fig. 1-57

PRECAUTIONS FOR THE PAUSE MECHANISM

The built-in pause mechanism functions to stop the tape temporarily in the Record and Play mode. This pause mechanism is activated by either of the following three operations:

- When the PAUSE key is pressed during recording or playback.

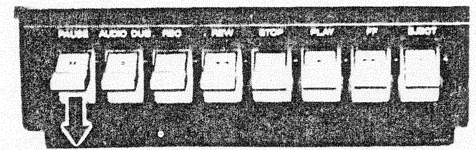

Fig. 1-58

- When the camera's start/stop switch is pressed to STOP if the VP-7100EG/EK is being used in combination with the AKAI portable video camera VC-7100EG/EK.

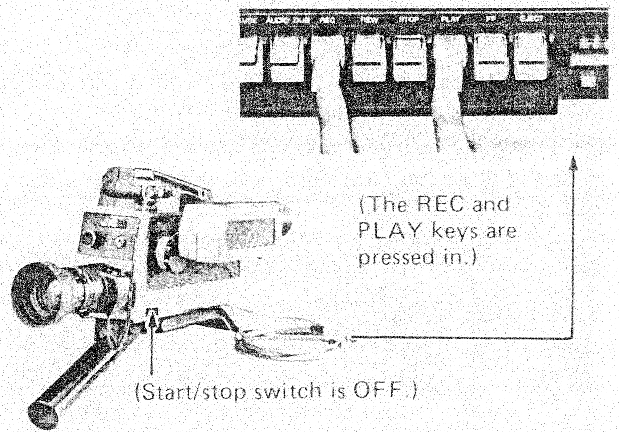
(The REC and PLAY keys are pressed in.)
(Start/stop switch is OFF.)

Fig. 1-59

- When the pause remote control switch RC-V1 is turned OFF during recording or playback if the remote control switch is connected to the REMOTE jack.

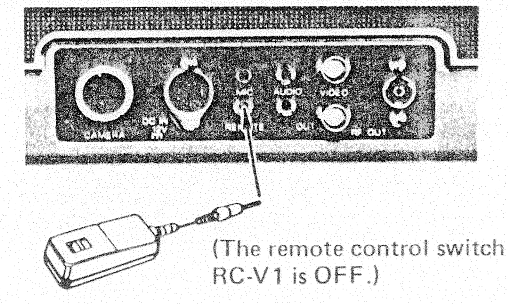
CAMERA
DC IN
MIC
REMOTE
AUDIO
VIDEO
OUT
RF OUT
(The remote control switch RC-V1 is OFF.)

Fig. 1-60

Caution!

Do not remain in the Pause mode longer than 5 minutes. If you are going to stop the tape for a longer period than 5 minutes, press the STOP key. (The battery will discharge even in the Pause mode.)

SECTION 2

MECHANISM

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2-1 GENERAL

The video cassette recorder "VHS" does not require tape to be manually threaded as with an open-reel type video tape recorder.
Instead, a special action for automatically loading and unloading tape is provided. Each operation of this "VHS" other than insertion or removal of the cassette is controlled by one key, except record, which for prevention of accidental erasure, requires two keys to be depressed. This means, pressing any one of the control keys sets up the mechanism to control all the assemblies used in that mode.
In addition, to prevent damage to the tape or the "VHS" it is necessary to go to STOP when switching one mode to another.
The main actions of the "VHS" mechanism are described below.

2-2 BASIC ACTION

2-2-1 Inserting and removing the video cassette

When the EJECT key is pressed, the cassette housing is lifted upward so the cassette can be easily loaded. Insert the cassette into the cassette housing completely. Then push the cassette cover downward by hand.
When removing a cassette, make sure the unit is in the Stop mode.

2-2-2 STOP to PLAY (loading)

Insert the video cassette and press the PLAY key. At that time, tape is pulled out from the cassette for loading. After tape loading is finished, the tape starts traveling and a playback picture appears on the TV monitor. As shown in Fig. 2-1 (a), tape is pulled from the supply reel and take-up reel during loading. After the tape starts traveling, it is wound onto the take-up reel disk, while being pulled from the supply reel, as shown in Fig. 2-1 (b).

NOTE: During the PAUSE key is depressed, the PLAY key does not function.

2-2-3 PLAY to STOP (unloading)

When the STOP key is pressed, the PLAY key is released from the lock. A fraction of a second later, unloading starts. During the unloading mode, the tape is wound onto the supply reel.

2-2-4 STOP to REW (Rewind model)

When the REW key is pressed, the rewind mechanism is locked by the function mechanism. At the same time tape is rewound from the take-up reel to the supply reel as shown in Fig. 2-2. By pressing the STOP key to stop the tape the REW key is released from the lock.

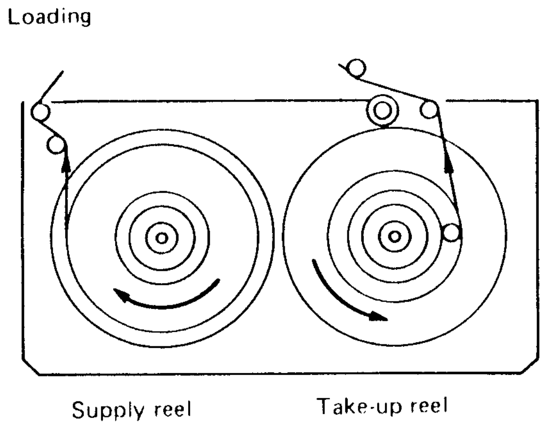

Fig. 2-1 (a)

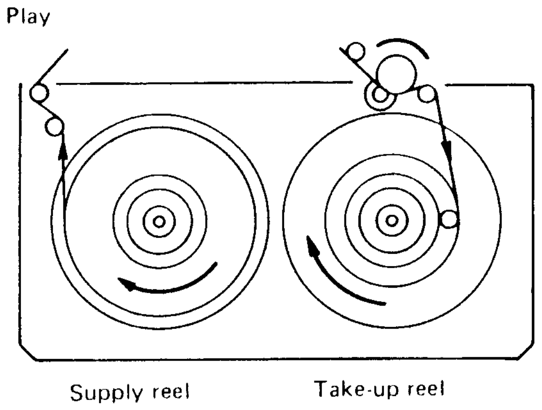

Fig. 2-1 (b)

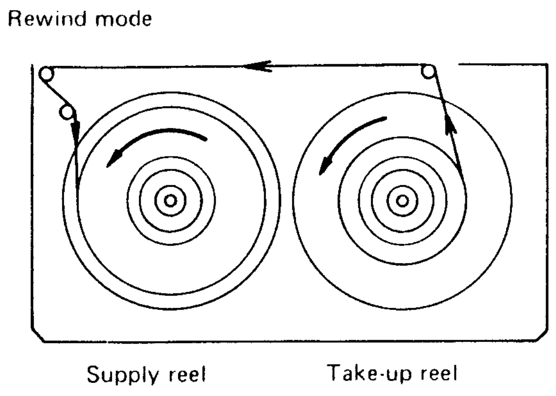

Fig. 2-2

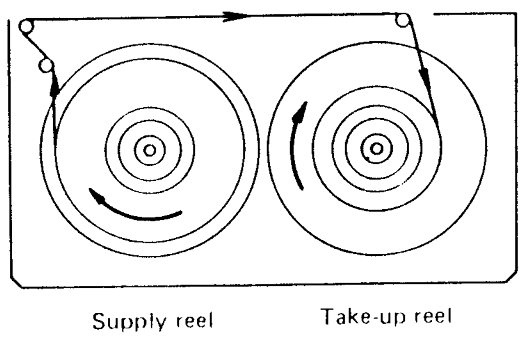

Fig. 2-3 F.F. mode

2-2-5 STOP to F.F. (Fast forward mode)

When the F.F. (fast-forward) key is pressed, it is held by the function mechanism. At the same time, tape is rapidly wound from the supply reel to the take-up reel as shown in Fig. 2-3. Pressing the STOP key stops the tape and the F.F. key is released.

2-2-6 PAUSE mode

The tape traveling is stopped when the PAUSE key is pressed in Play or Record mode.
In Pause mode, the mechanism actions are the same as in Record mode, except that the pinch roller is released from the capstan shaft and the take-up idler is released from the reel disk, so that tape traveling is stopped.
In Still mode, the mechanism actions are the same as in Play mode, except that the capstan DC motor is stopped, so that tape traveling is stopped.
When the PAUSE key is pressed again, the tape starts traveling again.

2-2-7 Automatic stop system (photo transistor operation)

Automatic stop is initiated when the photo transistor operates at the beginning or end of the tape in Play/Record, Rewind or Fast Forward mode.

1. As shown in Fig. 2-4(a), when rewinding to the beginning of the tape, the beam from the cassette lamp reaches the start sensor (photo transistor) through the clear leader tape, and the unit will stop automatically. Also, when clear leader is already present, the Rewind mode will not operate.

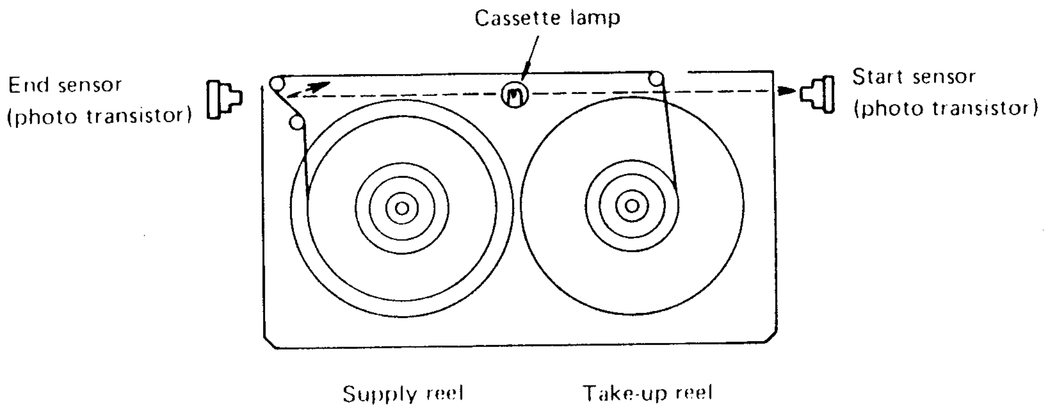

Fig. 2-4 (a) Beginning of the tape

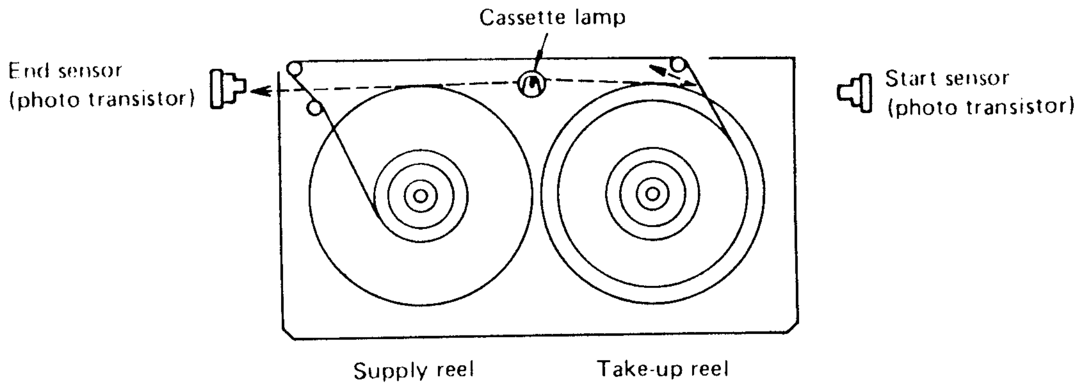

Fig. 2-4(b)

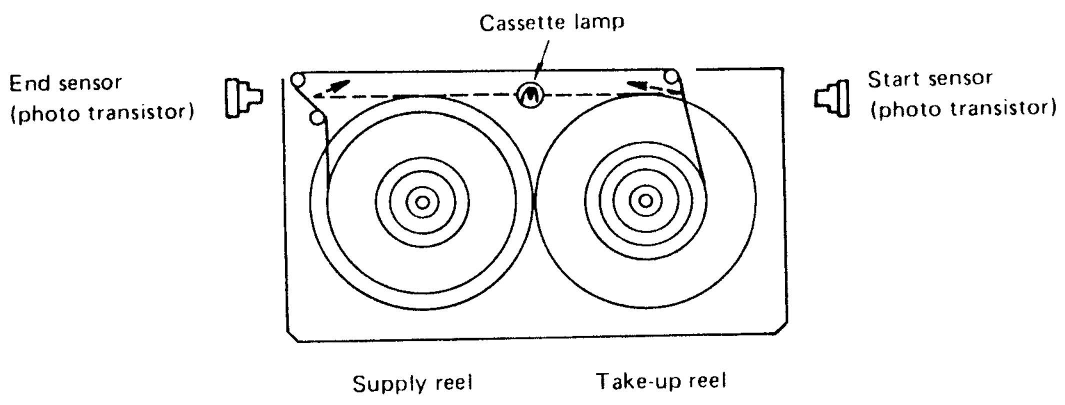
Cassette lamp
End sensor
(photo transistor)
Start sensor
(photo transistor)
Supply reel
Take-up reel

Fig. 2-4(c)

2. As shown in Fig. 2-4(b), when the light beam from the cassette lamp reaches the end sensor when in the Play/Record or Fast Forward mode, the unit will be stopped automatically. Also, when the light beam shines on the end sensor (photo transistor), Play/Record or Fast Forward modes will not operate.
3. When the light beam is interrupted by the video tape as shown in Fig. 2-4(c), all modes are available by pressing the corresponding key.
4. When the take-up reel disk rotation is stopped in Play or Record mode, the light beam is interrupted by the video tape as shown in Fig. 2-4(d), the unit will be stopped automatically.

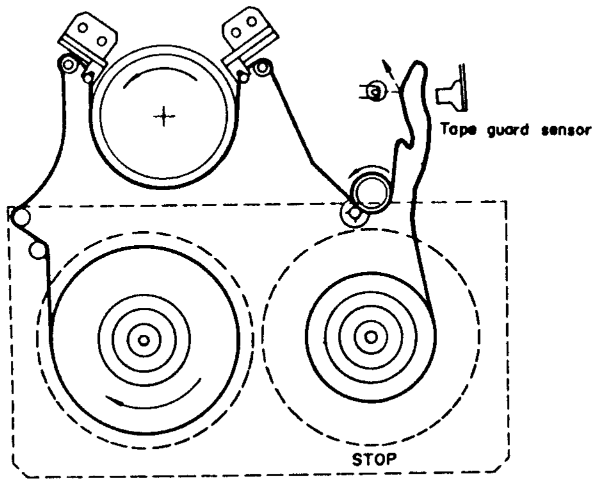
Tape guard sensor
STOP

Fig. 2-4(d)

2-3 FUNCTION OF MAIN COMPONENTS

2-3-1 Capstan motor

Refer to Fig. 2-5.
The capstan motor is a DC motor, which is controlled at a constant speed by a servo circuit. The rotation of the capstan motor is transmitted to the relay pulley, via the relay belt, and the relay pulley rotation is transmitted to the capstan flywheel via the capstan belt. On the other hand, the rotation of the relay pulley is transmitted to the rewind idler and the take-up idler via the reel drive belt, and the rotation of the rewind idler is transmitted to the unloading idler via the unloading idler belt. In short, all the above operations are made by the DC capstan motor. The capstan motor powers all the driving system such as the capstan shaft, take-up reel disk, and so forth.

2-3-2 Drum motor

As shown in Fig. 2-5, the rotation of the drum motor is transmitted to the drum pulley via a belt. The drum motor's rotation is controlled by the servo circuit.

2-3-3 Stop solenoid

When the automatic stop system operates, the stop solenoid operates to release the function keys.

2-3-4 Pinch roller solenoid

The pinch roller solenoid operates in all modes other than Stop and Pause, and performs the following functions:

1. Presses the pinch roller ass'y against the capstan shaft.
2. Presses the take-up idler ass'y against the take-up reel disk.
3. Removes the brake from the take-up and supply reel disks.

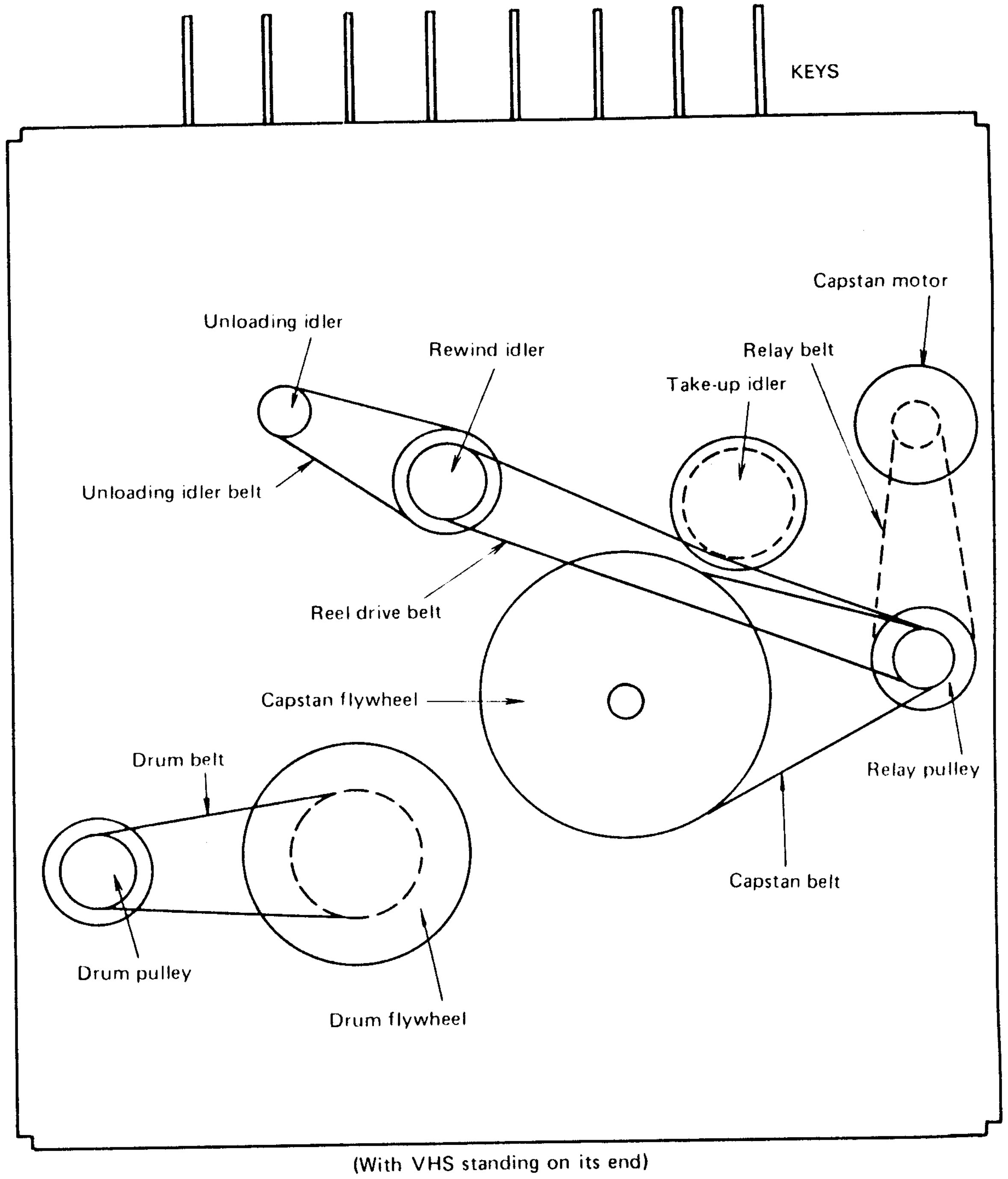
KEYS
Capstan motor
Unloading idler
Rewind idler
Relay belt
Take-up idler
Unloading idler belt
Reel drive belt
Capstan flywheel
Drum belt
Relay pulley
Capstan belt
Drum pulley
Drum flywheel
(With VHS standing on its end)

Fig. 2-5 DC motor drive mechanism

2-4 LAYOUT OF MAIN MECHANICAL AND ASSOCIATED PARTS

– TOP VIEW –

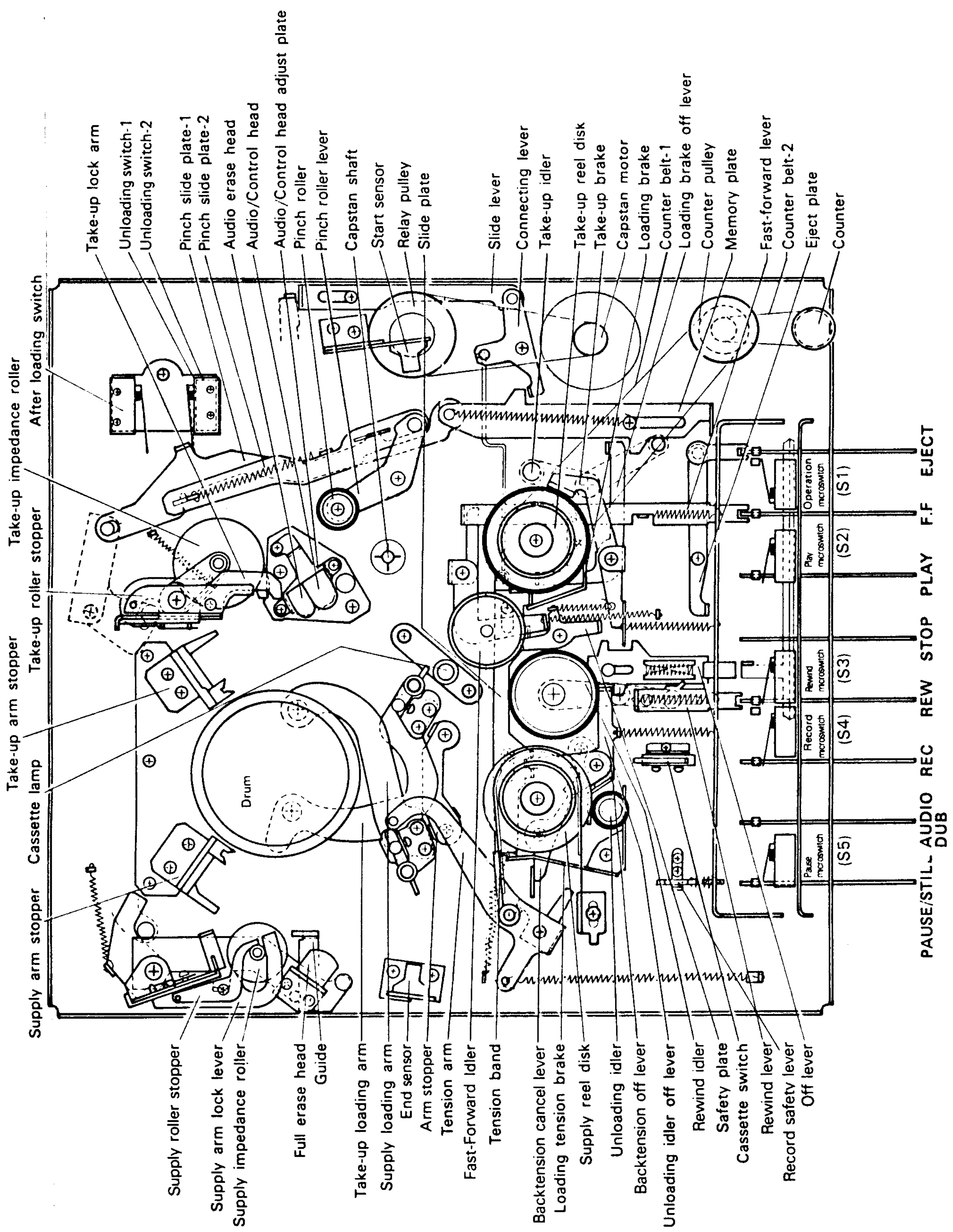
Take-up lock arm
Unloading switch-1
Unloading switch-2
Pinch slide plate-1
Pinch slide plate-2
Audio erase head
Audio/Control head
Audio/Control head adjust plate
Pinch roller
Pinch roller lever
Capstan shaft
Start sensor
Relay pulley
Slide plate
Slide lever
Connecting lever
Take-up idler
Take-up reel disk
Take-up brake
Capstan motor
Loading brake
Counter belt-1
Loading brake off lever
Counter pulley
Memory plate
Fast-forward lever
Counter belt-2
Eject plate
Counter
After loading switch
Take-up impedance roller
Take-up roller stopper
Take-up arm stopper
Cassette lamp
Supply arm stopper
Drum
Operation microswitch
(S1)
Play microswitch
(S2)
Rewind microswitch
(S3)
Record microswitch
(S4)
Pause microswitch
(S5)
EJECT
F.F
PLAY
STOP
REW
REC
AUDIO DUB
PAUSE/STILL
Supply roller stopper
Supply arm lock lever
Supply impedance roller
Full erase head
Guide
Take-up loading arm
Supply loading arm
End sensor
Arm stopper
Tension arm
Fast-Forward Idler
Tension band
Backtension cancel lever
Loading tension brake
Supply reel disk
Unloading idler
Backtension off lever
Unloading idler off lever
Rewind idler
Safety plate
Cassette switch
Rewind lever
Record safety lever
Off lever

Fig. 2-6(a) STOP mode mechanism (TOP VIEW)

– BOTTOM VIEW –

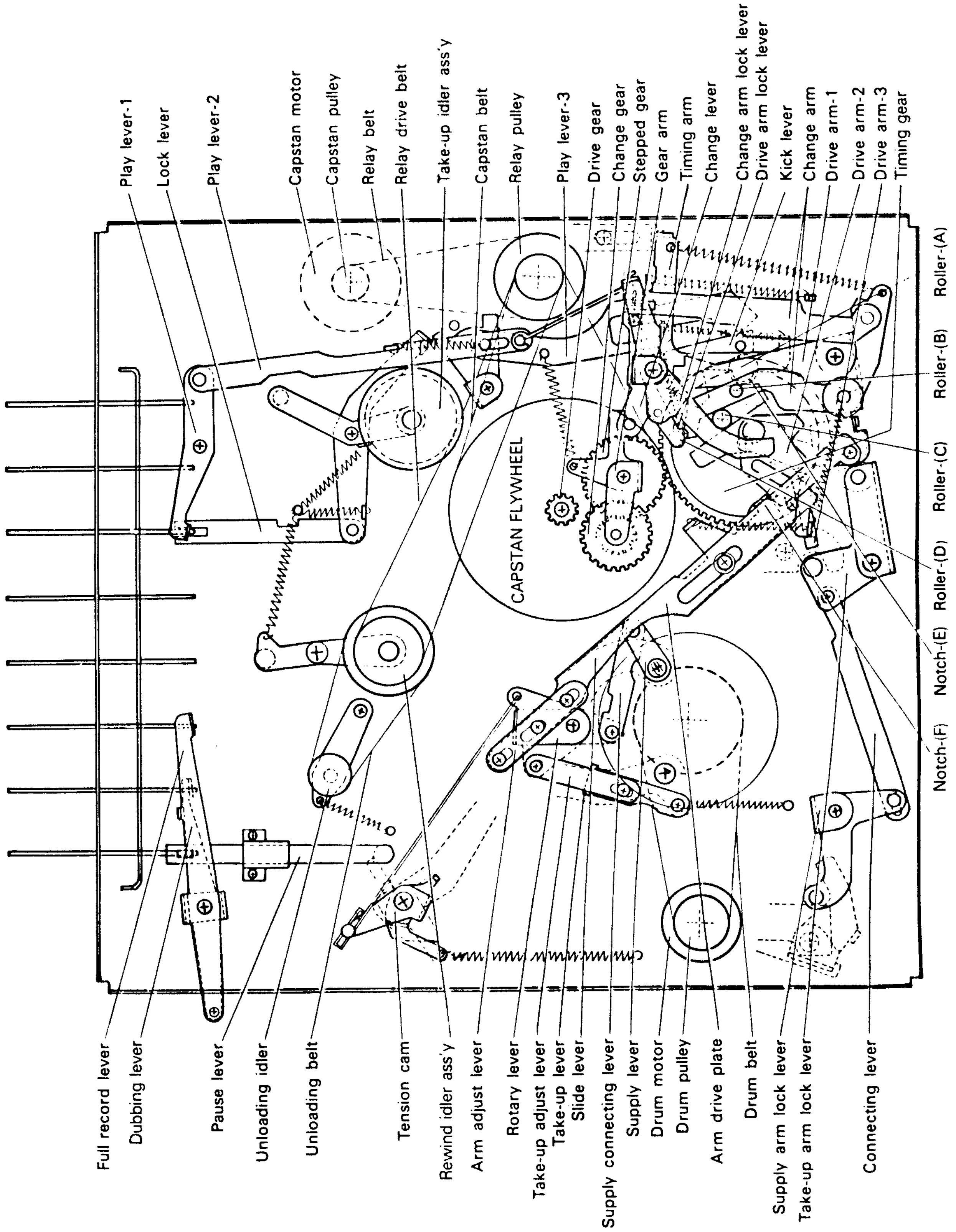
Play lever-1
Lock lever
Play lever-2
Capstan motor
Capstan pulley
Relay belt
Relay drive belt
Take-up idler ass'y
Capstan belt
Relay pulley
Play lever-3
Drive gear
Change gear
Stepped gear
Gear arm
Timing arm
Change lever
Change arm lock lever
Drive arm lock lever
Kick lever
Change arm
Drive arm-1
Drive arm-2
Drive arm-3
Timing gear
Roller-(A)
Roller-(B)
Roller-(C)
Roller-(D)
Notch-(E)
Notch-(F)
CAPSTAN FLYWHEEL
Full record lever
Dubbing lever
Pause lever
Unloading idler
Unloading belt
Tension cam
Rewind idler ass'y
Arm adjust lever
Rotary lever
Take-up adjust lever
Take-up lever
Slide lever
Supply connecting lever
Supply lever
Drum motor
Drum pulley
Arm drive plate
Drum belt
Supply arm lock lever
Take-up arm lock lever
Connecting lever

Fig. 2-6(b) STOP mode mechanism (BOTTOM VIEW)

2-5 STOP MODE MECHANISM

Refer to Fig. 2-6(a), (b).
Stop mode means the condition in which no manual keys are pressed, and the supply loading arm and the take-up loading arm are in the stop position, with the unloading switches pressed (on position). Also, the unloading idler is pressed to the supply reel disk and the take-up brake affects the take-up reel disk. Capstan and drum motors are stopped.
When the unit is in this condition, it is possible to press the EJECT key and to load or unload a cassette.

2-6 LOADING-1 MECHANISM

When pressing the PLAY key after being in the Stop mode, the play lever-1, 2, 3 moves to arrows (a), (b), (c) as shown in Fig. 2-7.
By this pulling action of the play lever-3, the downward stud (D) on the change lever is pulled up at the top of the groove of the play lever-3, then the change lever is turned counterclockwise (d). As a result, the gear arm becomes free and starts rotation clockwise (e) being pulled by the force of the spring-2, then the change gear is pressed to the drive gear on the capstan shaft.
Accordingly, the rotation of the capstan motor is transmitted via a belt to the following, Capstan motor – Relay pulley – Capstan flywheel, Drive gear and change gear – Stepped gear – Timing gear.
In short, when the drive gear contacts with the change gear, the timing gear starts rotation clockwise. By this clockwise rotation, the roller (A) which is fixed on the timing arm and has been set in the notch (F) of the timing gear runs on edge of the timing gear. At this time, the timing arm moves to arrow (g) by the rotation of the timing gear; then the timing arm is locked by the edge of the timing gear.

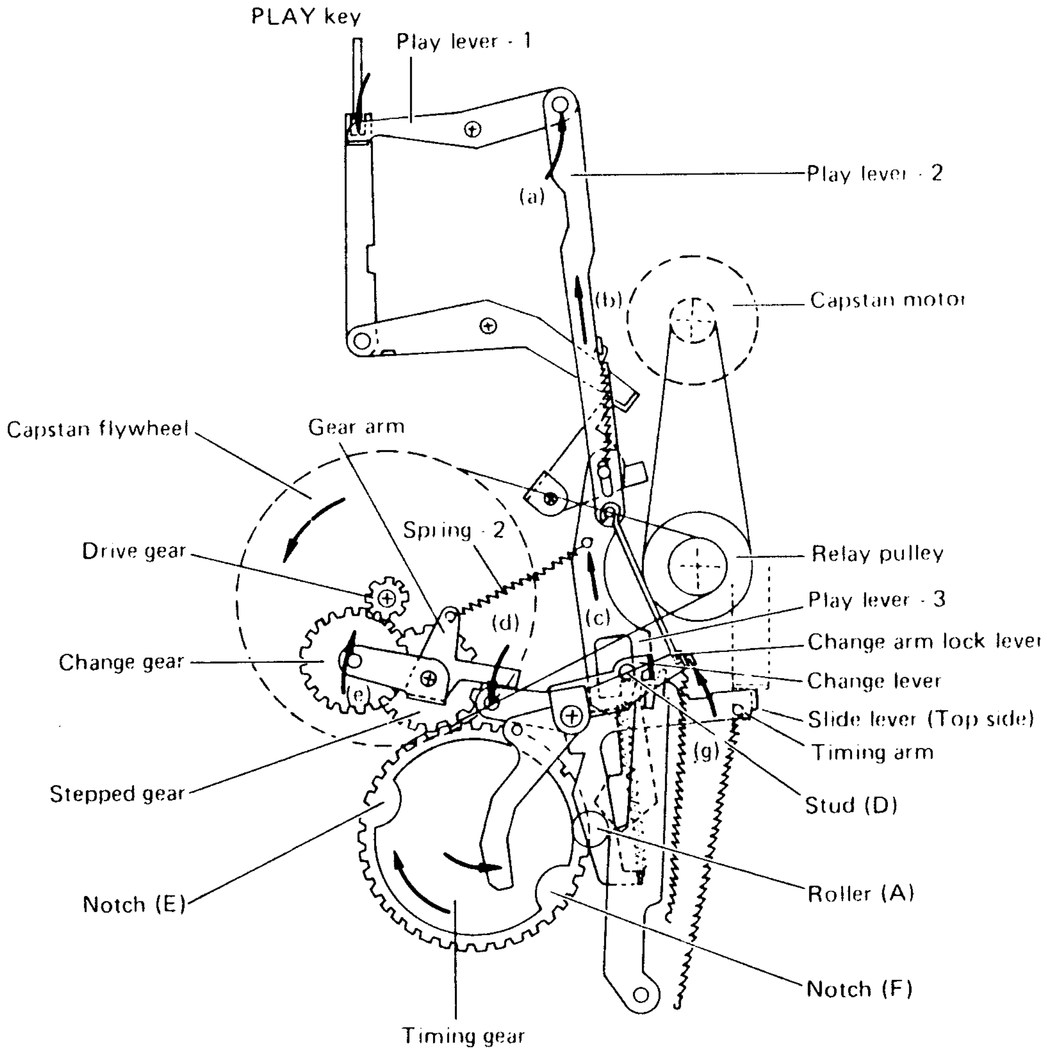
PLAY key
Play lever - 1
(a)
Play lever - 2
(b)
Capstan motor
Capstan flywheel
Gear arm
Drive gear
Spring - 2
Relay pulley
Play lever - 3
(d)
(c)
Change arm lock lever
Change gear
(e)
Change lever
Slide lever (Top side)
(g)
Timing arm
Stepped gear
Stud (D)
Notch (E)
Roller (A)
Notch (F)
Timing gear

Fig. 2-7 Loading-1 mechanism (Bottom view)

By the pulling action of the play lever-3, namely the Gear arm rotates as arrow (e) by the force of spring-2, so that the change gear contacts with the drive gear; then the timing gear starts clockwise rotation. However, the change arm lock lever moves to arrow (g) by the pulling action of the play lever-2 through the rod.
After that the timing gear continues its clockwise rotation.
Refer to Fig. 2-8 Loading-1 mechanism (Top view).
When the manual PLAY key is pressed, the play switch and operate switch are turned on, so that the capstan DC motor and drum DC motor both start rotation. Also, the pinch roller solenoid is energized as a result. It removes the brake from the take-up and supply reel disks as shown in Fig. 2-17. At the same time, the off lever moves to arrow (a) by the function mechanism, so that the unloading idler releases from the supply reel disk by the movement of the unloading idler off lever, also the loading tension brake supplies to supply reel disk and the take-up brake releases from the take-up reel disk.
However, by the timing arm movement located in bottom side, see Fig. 2-7, the slide lever moves to arrow (e) and the connecting lever, memory plate and pinch roller slide plate-1, -2 moves to arrows (f), (g), (h) as shown in Fig. 2-8, so that the pinch roller and the take-up roller stopper mechanism moves to arrows (i), (k) for stand-by position. At this time, unloading switches-1 and -2 are in the off position.
Also, the slide plate moves to arrow (j) by the clockwise rotation(f) of the connecting lever, so that the loading tension brake and loading brakes supplies to the supply reel disk and the take-up reel disk. Also, the safety plate moves to arrow (e) to lock the off lever by the force of a spring.

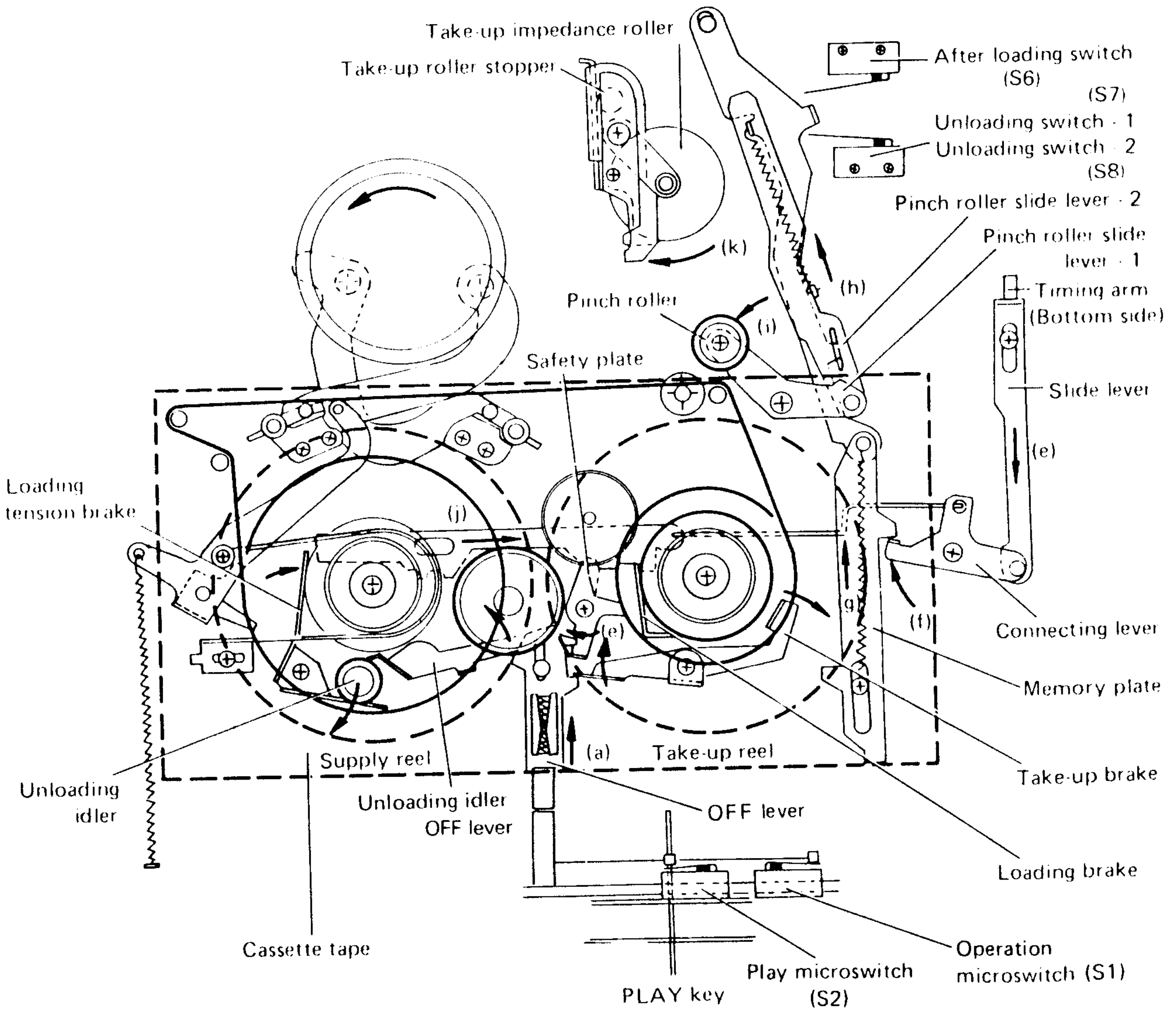
Take-up impedance roller
Take-up roller stopper
After loading switch (S6)
(S7)
Unloading switch - 1
Unloading switch - 2
(S8)
Pinch roller slide lever - 2
Pinch roller slide lever - 1
(k)
(h)
Timing arm (Bottom side)
Pinch roller
(i)
Safety plate
Slide lever
(e)
Loading tension brake
(j)
Connecting lever
(e)
g
(f)
Memory plate
Take-up brake
(a)
Take-up reel
Supply reel
Unloading idler
Unloading idler OFF lever
OFF lever
Loading brake
Cassette tape
Operation microswitch (S1)
Play microswitch (S2)
PLAY key

Fig. 2-8 Loading-1 mechanism (Top view)

2-7 LOADING-2 MECHANISM

Refer to Fig. 2-9, Loading-2 mechanism (Bottom view). Corresponding to the clockwise rotation (a) of the timing gear, the roller (C) fixed on the timing gear also makes clockwise rotation.
By this rotation of the roller (C), the drive arm is moved to arrow (b) and the change arm-1 and -2 also rotates counterclockwise (c) being pulled by the force of the spring connected with the timing arm. However, the rotation of the change arm-1 and -2 stops at the point that the roller (B), also fixed on the change arm-2, touches the change arm lock lever.
On the other hand, by the rotation of the roller (C), as shown in Fig. 2-10, namely the counterclockwise movement of the drive arm, the arm drive plate connected with the drive arm moves to arrow (d) and also the slide lever is pulled toward to arrow (d). Accordingly, the rotary lever starts clockwise rotation (e). By the clockwise rotation of the rotary lever, the take-up loading arm lever moves to arrow (f) and the take-up loading arm shafts rotation clockwise to pull the video tape from the cassette. At the same time, also the supply loading lever rotates counterclockwise (g) and the supply loading arm pulls the video tape from the cassette. By the clockwise rotation of the rotary lever, the tension arm cam rotates counterclockwise (h) by the pulling action of the rod. This frees the tension cam, which has locked the tension arm.
In short, the loading arm and the tension arm start operation by the movement of the drive arm.
As shown in Fig. 2-10, the rotary lever rotates clockwise (e) by the movement of the drive arm. As a result, the supply loading arm and the take-up loading arm are moved to arrows (a), (b) as shown in Fig. 2-11. Also, the tension arm is made free by the movement of the tension cam on the bottom side, and the tension arm rotates counterclockwise (c) by the force of the spring until the tension arm contacts with the backtension cancel lever. At this time, the backtension is not furnished to the supply reel disk. As the result, videl tape is pulled from the cassette by the supply and take-up loading arm.

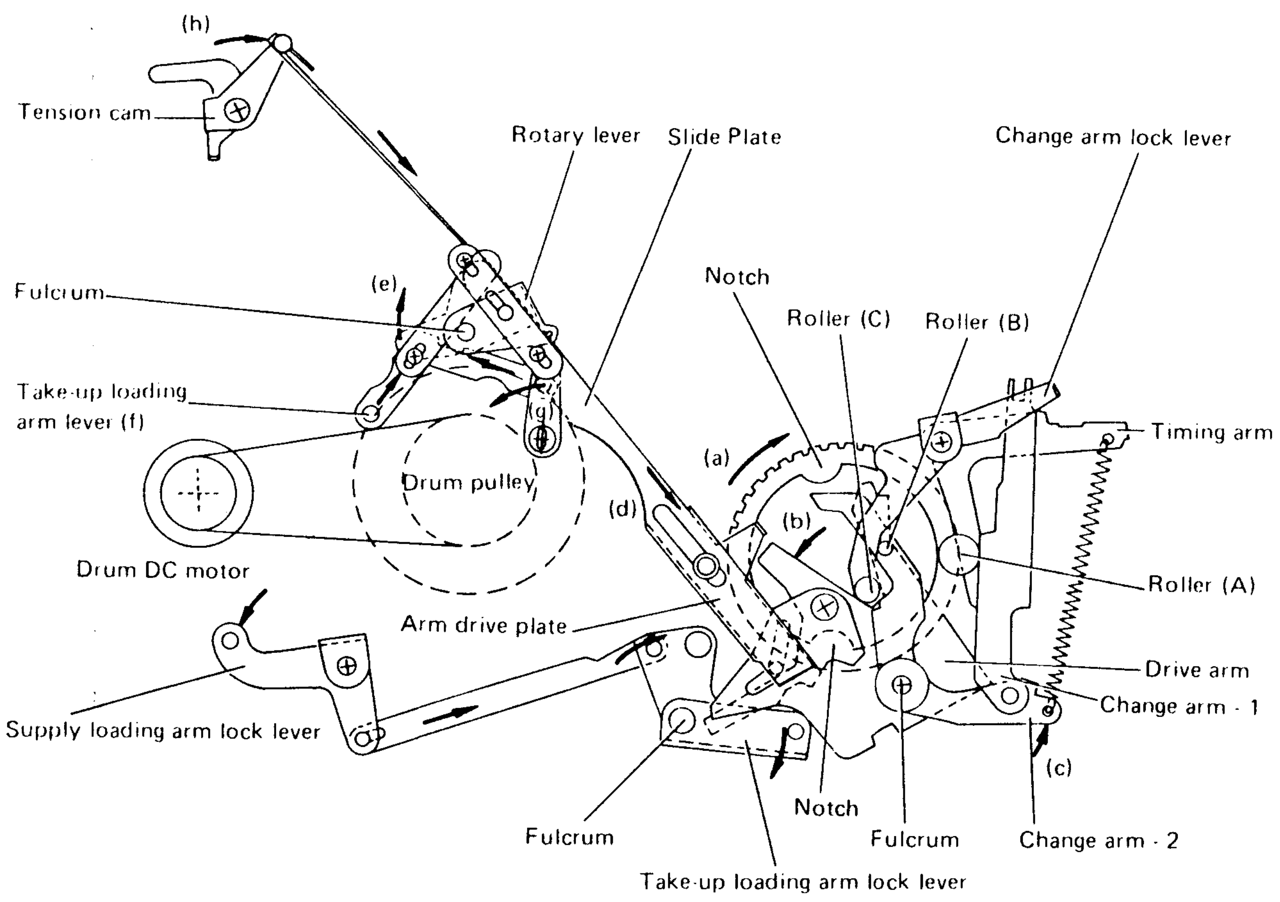
(h)
Tension cam
Rotary lever
Slide Plate
Change arm lock lever
Fulcrum
(e)
Notch
Roller (C)
Roller (B)
Take-up loading arm lever (f)
(g)
Timing arm
(a)
Drum pulley
(d)
(b)
Drum DC motor
Roller (A)
Arm drive plate
Drive arm
Change arm - 1
Supply loading arm lock lever
(c)
Notch
Fulcrum
Fulcrum
Change arm - 2
Take-up loading arm lock lever

Fig. 2-9 Loading-2 mechanism (Bottom view)

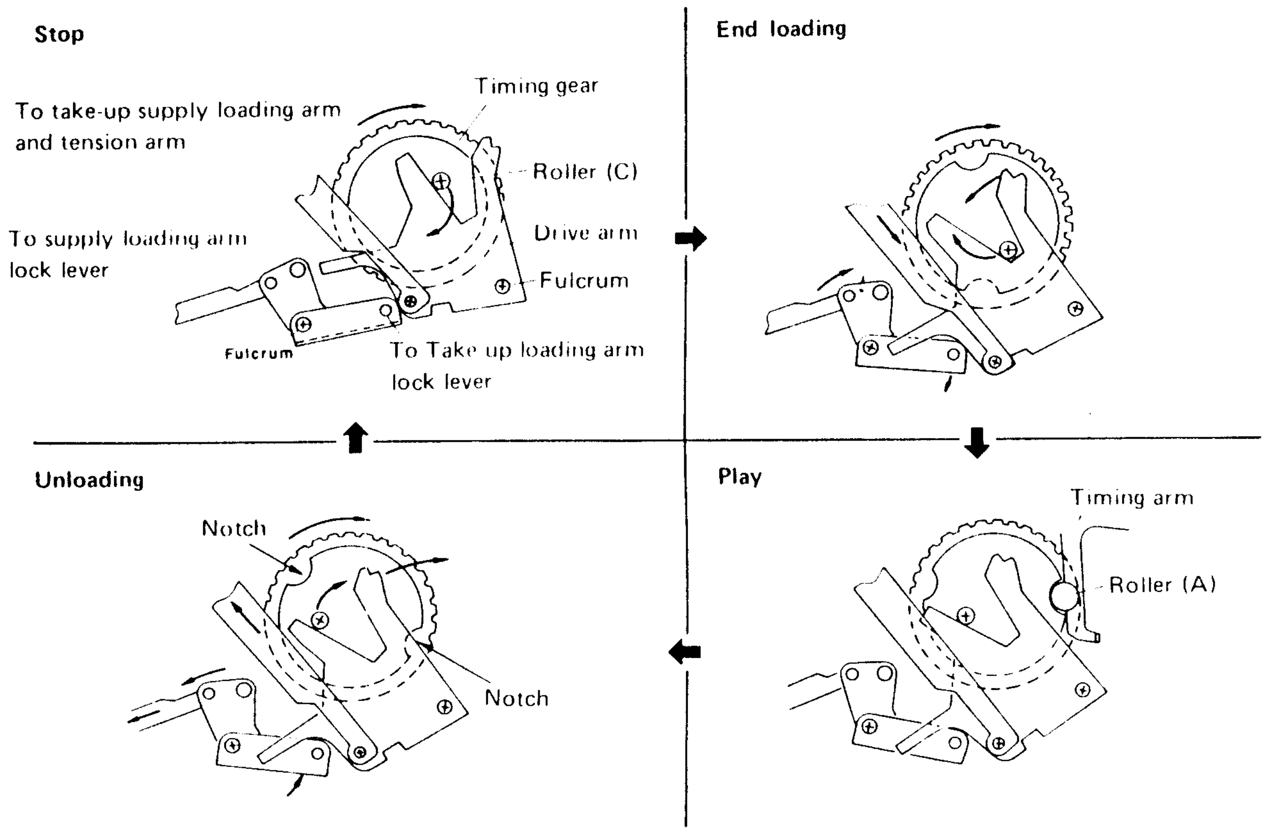
Stop
End loading
Timing gear
To take-up supply loading arm and tension arm
Roller (C)
To supply loading arm lock lever
Drive arm
Fulcrum
Fulcrum
To Take up loading arm lock lever
Unloading
Play
Timing arm
Notch
Roller (A)
Notch

Fig. 2-10 Loading and Unloading

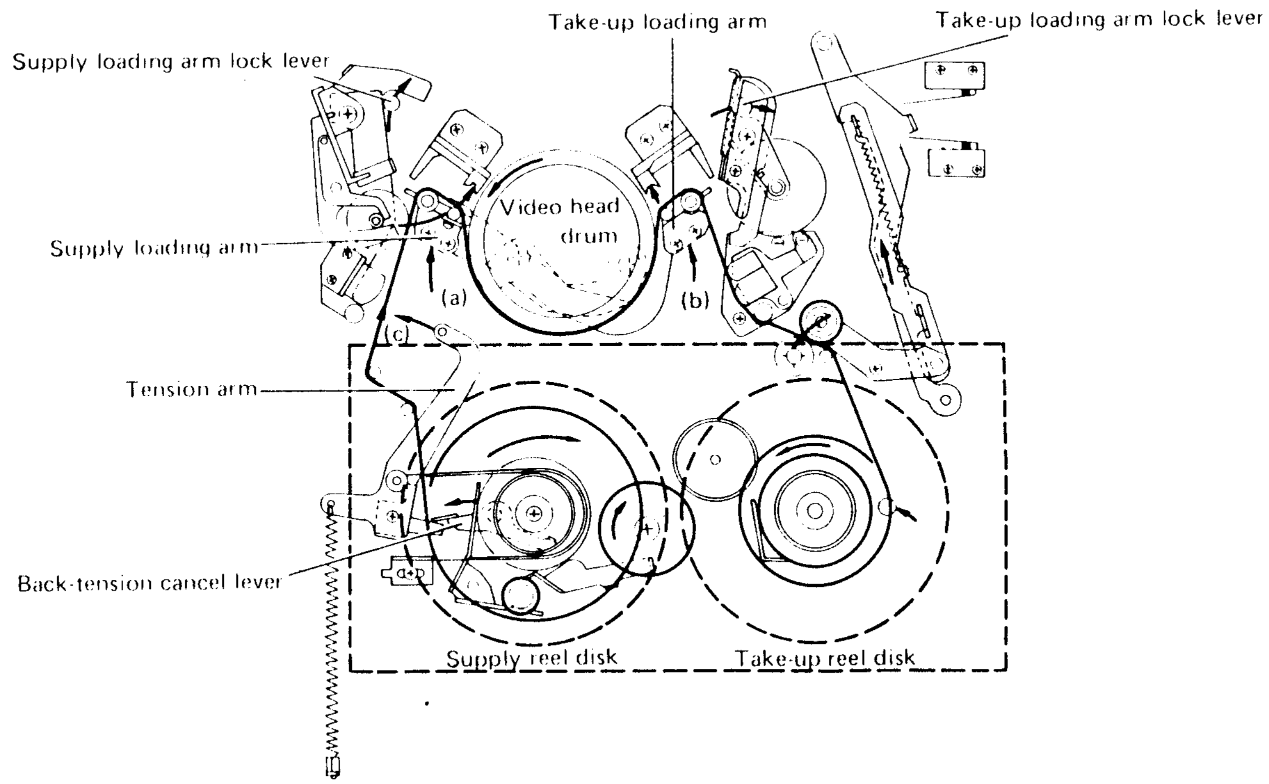
Take-up loading arm
Take-up loading arm lock lever
Supply loading arm lock lever
Video head drum
Supply loading arm
(a)
(b)
(c)
Tension arm
Back-tension cancel lever
Supply reel disk
Take-up reel disk

Fig. 2-11 Loading-2 mechanism (Top view)

2-8 PLAY MODE MECHANISM

Refer to Fig. 2-12, Play mode mechanism (bottom view). By the rotation of the roller (C) on the timing gear, the drive arm moves to arrow (d) and the arm drive plate is pulled to arrow (e).
When the loading arm reaches to the loading end, the movement (d) of the drive arm is effective only to the drive arm plate, and the take-up loading arm lock lever. In this time, the movement of the loading arm stops. On the other hand, by the rotation of the drive arm, the take-up loading arm lock lever turns clockwise (f) to lock the take-up loading arm, and the supply loading arm lock lever turns counterclockwise to lock the supply loading arm. By the rotation of the take-up loading arm lock lever, the pinch slide plate operates and the pinch roller is pressed to the capstan shaft.
When the drive arm reached to the almost fully counterclockwise position of the drive arm movement by the roller (C) fixed on the timing gear, the stud fixed on the bottom of the timing gear kicks the kick lever counterclockwise (g). Then the kick lever pushes the play lever-3 to arrow (g). As a result, the stud of the change lever will be free from the locking on the upper side of the play lever-3 groove, so that the change lever is ready to move in the direction of arrow (i).
On the other hand, when the drive arm reaches almost fully counterclockwise position of the drive arm movement, the drive arm lock lever fixed on the change arm lock lever will be free and pulled counterclockwise (h) by the spring. Corresponding to the rotation of the timing gear and the roller (C), the drive arm is locked by the roller (D) of the drive arm lock lever. Then, the roller (A) of the timing arm goes into the notch (E) of the timing gear. By this operation, the change lever becomes free, and starts rotation to arrow (i) by the force of spring. At this stage, loading is completed and the machine assumes Play mode.
Refer to Fig. 2-13, Play mode mechanism (Top view). By the movement of the drive arm, the loading arm starts to load. When the loading arm reached loading end, the take-up arm stopper and the supply arm stopper moves as arrows (a), (b) by the rotation of the drive arm through the take-up loading arm lock lever and the supply loading arm lock lever (bottom side). As the result, the loading arm is locked at the arm stopper. And also, corresponding to movement of the supply arm stopper, the full-erase head and the guide pole are moved to the Play mode position. At this time, tape traveling is determined by the edge of the guide pole.
On the other hand, by the movement of the take-up loading arm lock lever, the pinch roller slide plate-2 connected with the pinch roller slide plate-1 by the spring is pulled to arrow (c). As a result, the pinch roller is closer to the capstan shaft. Also, the after-loading switch is turned on by the edge of the pinch roller slide plate-1. In this condition, the capstan solenoid is energized. The pinch roller slide plate-1 and -2 are more moved to arrow (c) by the plunger movement. As a result, the pinch roller is pressed against the capstan shaft. At that time, the tape traveling starts.

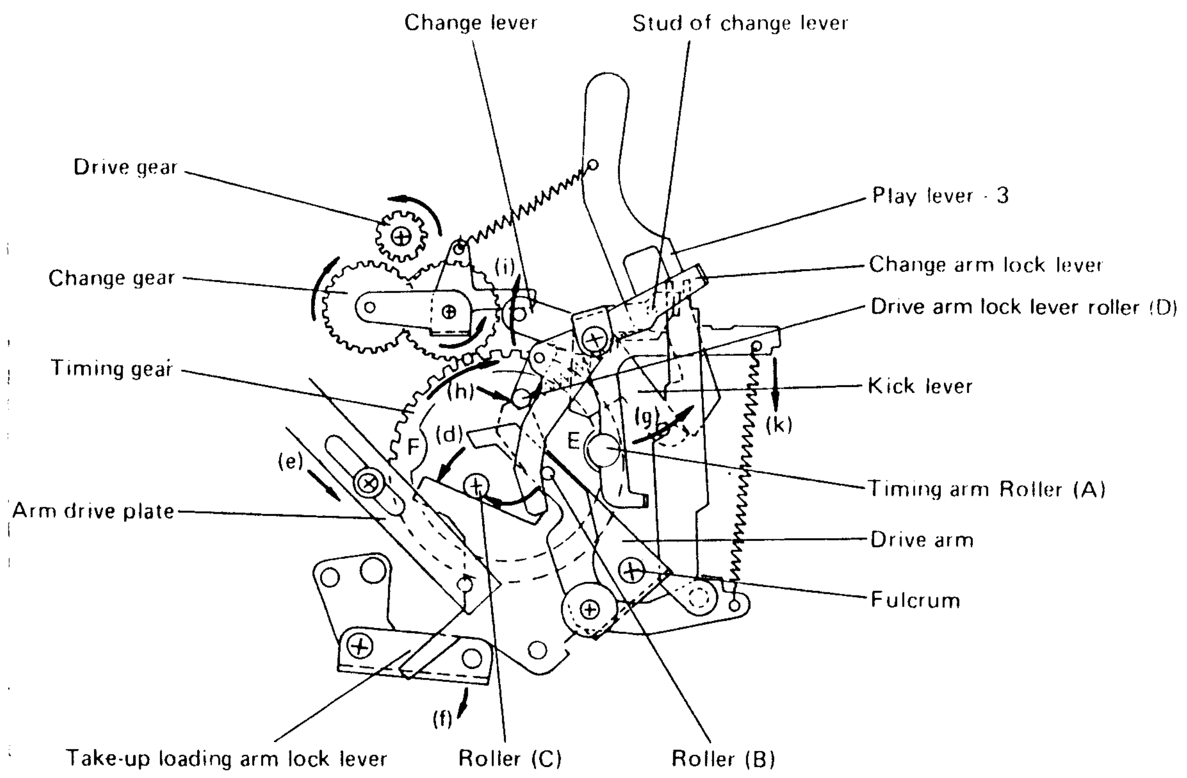
Change lever
Stud of change lever
Drive gear
Play lever - 3
Change gear
Change arm lock lever
Drive arm lock lever roller (D)
Timing gear
Kick lever
Timing arm Roller (A)
Arm drive plate
Drive arm
Fulcrum
Take-up loading arm lock lever
Roller (C)
Roller (B)
(i)
(h)
(d)
(e)
F
E
(g)
(k)
(f)

Fig. 2-12 Play mode mechanism (bottom view)

At the same time, by the "pulling-up" action of the memory plate with the pinch roller slide lever-1, the take-up idler lever falls into the edge of the memory plate at the point (A) and the take-up idler contacts with the take-up reel disk. At the same time, the loading brake releases from the take-up reel disk by the loading brake off lever.
In other words, the pressing action of the pinch roller and take-up idler and releasing action of the loading brake are separated at nearly the same time. However, the roller (C) of the timing arm (bottom side) has not fallen into the hollow (E) of the timing gear yet, up to this time.
When the roller (C) comes into the notch (E) of the timing gear, the change gear is stopped (bottom side). At the same time, the timing arm (bottom side) is moved to arrow (k), and the slide plate moves to arrow (f) by spring (A).
By movement of the slide plate to the left, the supply loading brake is released from the supply reel disk and the backtension cancel lever rotates clockwise (g). As a result, the supply backtension becomes effective. After that, the machine will be Play mode.

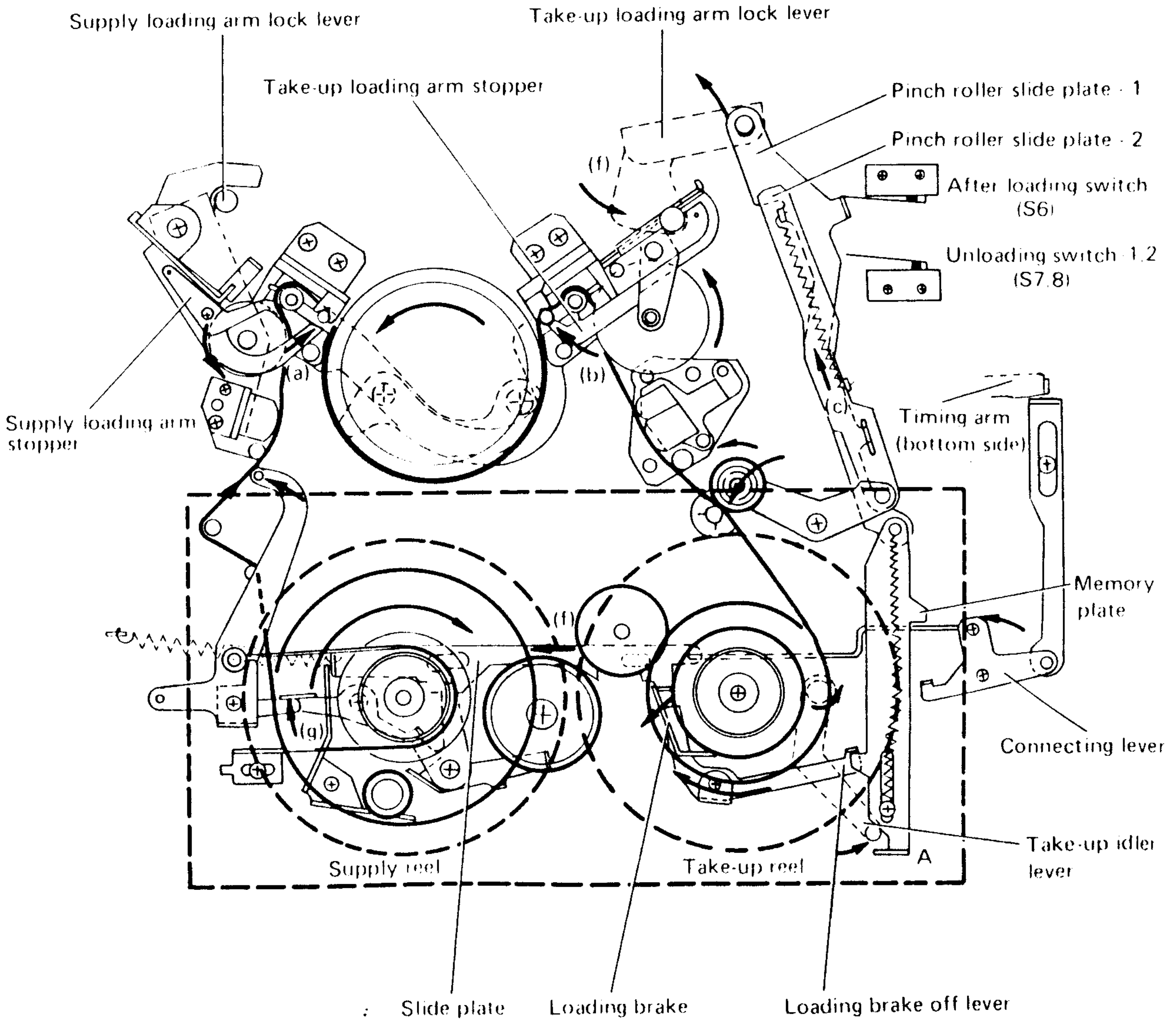
Supply loading arm lock lever
Take-up loading arm lock lever
Take-up loading arm stopper
Pinch roller slide plate - 1
Pinch roller slide plate - 2
After loading switch (S6)
Unloading switch 1.2 (S7.8)
Supply loading arm stopper
Timing arm (bottom side)
Memory plate
Connecting lever
Take-up idler lever
Supply reel
Take-up reel
A
Slide plate
Loading brake
Loading brake off lever
(a)
(b)
(c)
(f)
(g)
(f)

Fig. 2-13 Play mode mechanism (Top view)

2-9 UNLOADING MECHANISM (Bottom view)

Refer to Fig. 2-14, Unloading mechanism (bottom view). When the STOP key is pressed, from the Play mode, the play function mechanism is released from the lock, so that the play lever-1 and -2 which lock the change arm lock lever through the rod is moved to arrow (a) and the change arm lock lever is turned clockwise (a) by the force of spring. Also the drive arm lock lever releases from the drive arm; then the drive arm becomes free. When the change arm lock lever turned clockwise, the roller (B) fixed on the change arm becomes free so that the change arm turns counterclockwise (b) by the force of spring. At this time, the other side of the change arm moves to arrow (c), so that the change lever turned to arrow (e). As a result, the change gear is contacted with the drive gear by the rotation of the gear arm. Then, the timing gear rotates clockwise again, and the drive arm turns counterclockwise (f) to the original position.

When the roller (A) reached to the notch (E) of the timing gear, the change gear is released from the drive gear by the counterclockwise rotation of the gear arm. At this time, the rotation of the timing gear is stopped.

Refer to Fig. 2-15, Unloading mechanism (Top view).

When pressing the STOP key from the Play mode, the play function mechanism is released. As a result, the unloading idler contacts with the supply reel disk, and the supply reel disk winds up the tape during unloading. At the same time, the take-up brake contacts the take-up reel disk by the movement of the off lever. On the other hand, the supply roller stopper, supply loading arm, take-up roller stopper and take-up loading arm are returned to original stop position, however, the roller (A) of the timing gear (bottom side) runs on the edge of the timing gear, the timing arm moves downward so that the slide plate moves clockwise. By the clockwise movement of the slide plate, the backtension cancel lever rotates counterclockwise to release the backtension from the supply reel disk. When the unloading started, the after loading switch is turned off and the after unloading is completed, the unloading switch is turned off then motor rotation is stopped.

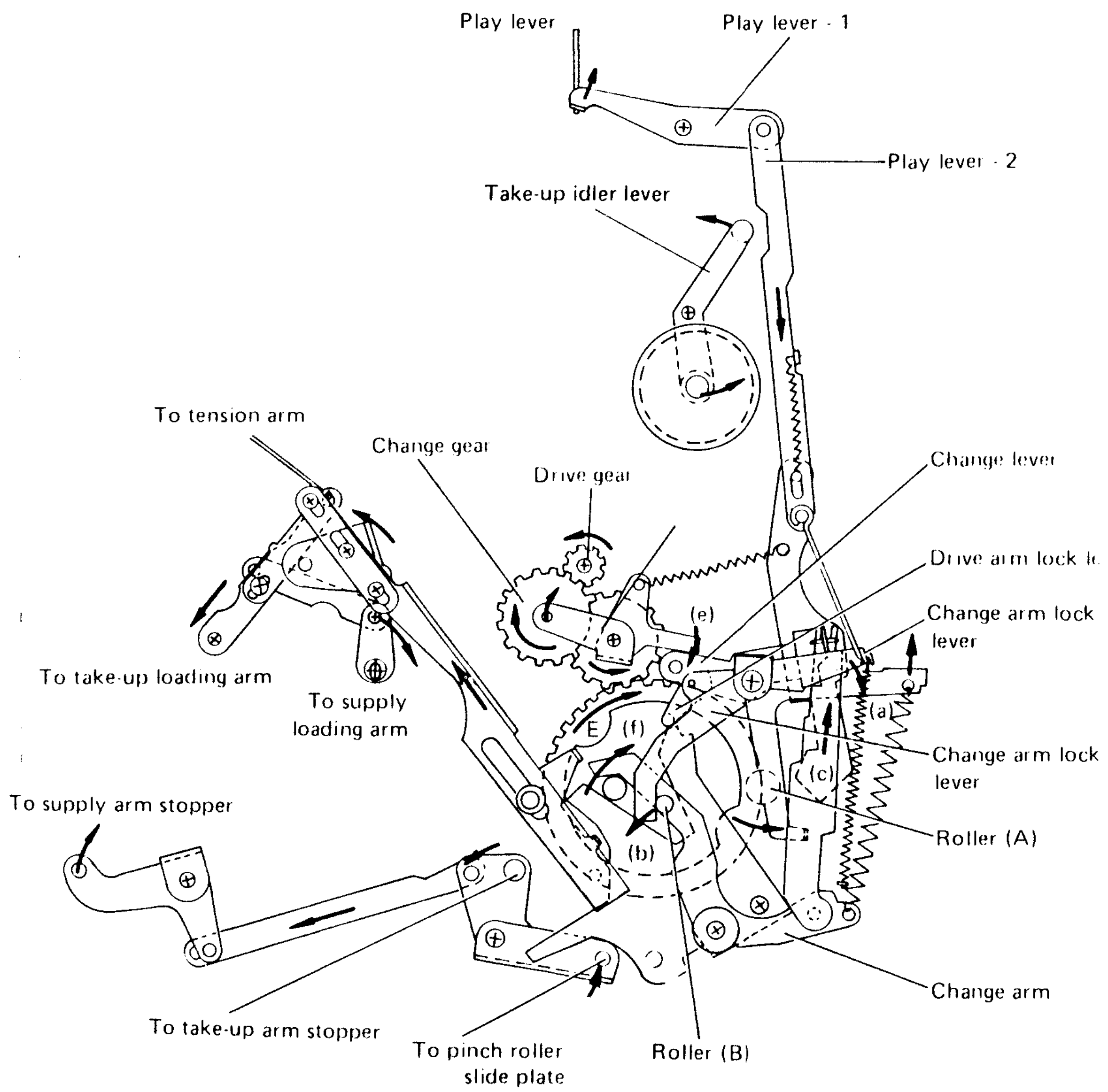
Play lever
Play lever - 1
Play lever - 2
Take-up idler lever
To tension arm
Change gear
Drive gear
Change lever
Drive arm lock le
(e)
Change arm lock lever
(a)
To take-up loading arm
To supply loading arm
E
(f)
(c)
Change arm lock lever
Roller (A)
To supply arm stopper
(b)
Change arm
To take-up arm stopper
To pinch roller slide plate
Roller (B)

Fig. 2-14 Unloading mechanism (Bottom view)

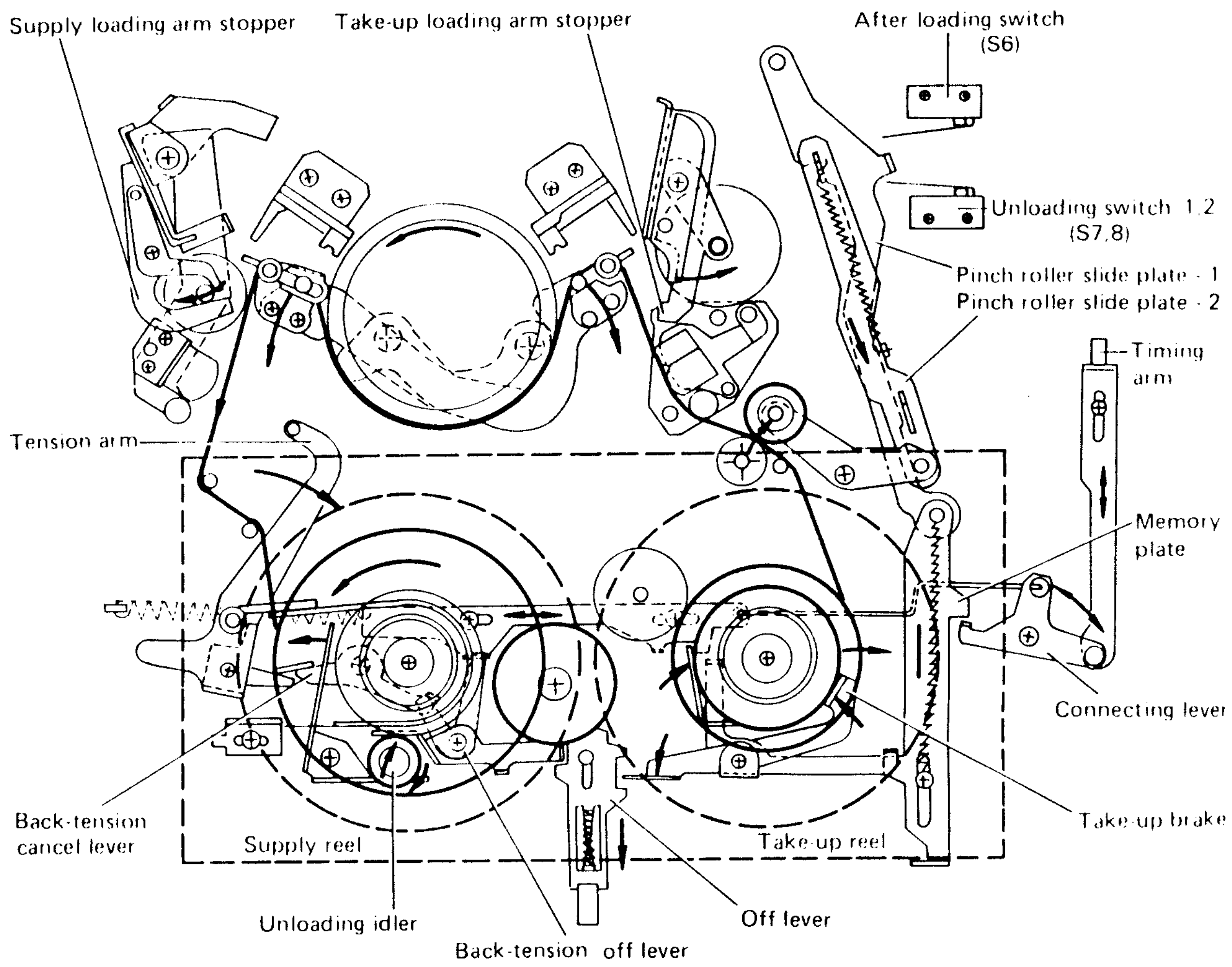
Supply loading arm stopper
Take-up loading arm stopper
After loading switch
(S6)
Unloading switch 1, 2
(S7, 8)
Pinch roller slide plate - 1
Pinch roller slide plate - 2
Timing arm
Tension arm
Memory plate
Connecting lever
Back-tension cancel lever
Supply reel
Take-up reel
Take-up brake
Unloading idler
Back-tension off lever
Off lever

Fig. 2-15 Unloading mechanism (Top view)

2-10 F.F. MODE MECHANISM

When pressing the F.F. key, the unloading idler releases from the supply reel disk and the take-up brake releases from the take-up reel disk by the movement to arrow (a) of the off lever. Also, the pinch roller solenoid is turned on, the adjust plate is released from the take-up reel disk. Also, the supply brake arm ass'y is released from the supply reel disk. As a result, the take-up reel disk and the supply reel disk become free.

Thus, by pressing up the F.F. lever, the F.F. idler moves to arrow (b) so that the F.F. idler contacts with the rewind idler and the take-up reel disk. As a result, the tape is wound up from the supply reel disk to take-up reel disk.

2-11 REWIND MODE MECHANISM

When the REWIND key is pressed, the unloading idler is released from the supply reel disk and the take-up brake is released from the take-up reel disk by the movement to arrow (a) of the off lever. Also, the pinch roller solenoid is turned on, the adjust plate is released from the take-up reel disk. Also, the supply brake arm ass'y is released from the supply reel disk. As a result, the take-up reel disk and the supply reel disk become free.

On the other hand, by "pressing-up" action of the REW lever, the rewind idler contacts with the supply reel disk, so that the tape is wound up from the take-up reel disk to the supply reel disk.

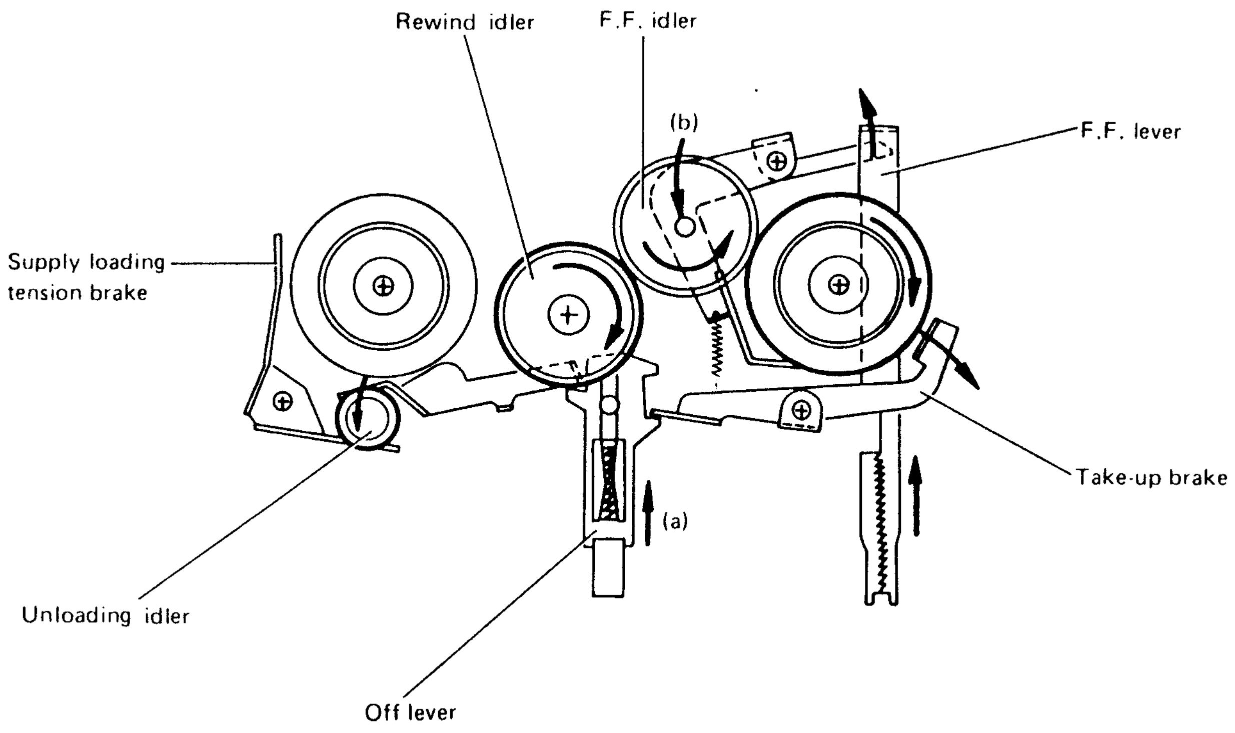
Rewind idler
F.F. idler
(b)
F.F. lever
Supply loading tension brake
Take-up brake
(a)
Unloading idler
Off lever

Fig. 2-16 F.F. mode mechanism

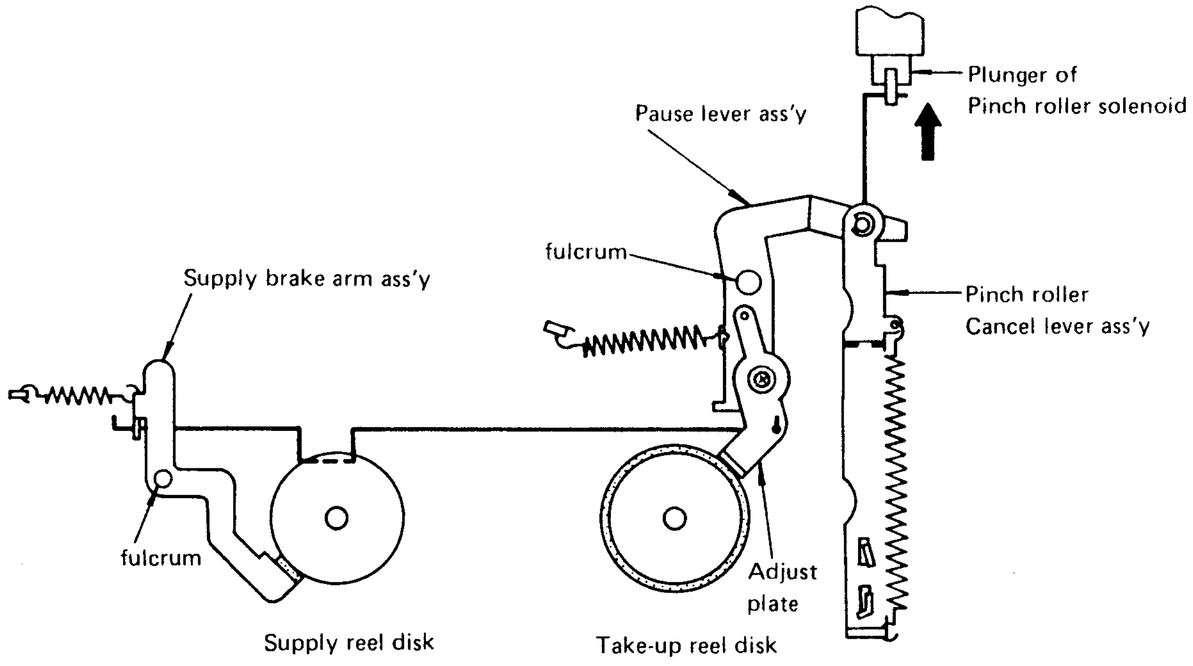
Plunger of Pinch roller solenoid
Pause lever ass'y
fulcrum
Pinch roller Cancel lever ass'y
Supply brake arm ass'y
fulcrum
Adjust plate
Supply reel disk
Take-up reel disk

Fig. 2-17 Pinch roller solenoid drive mechanism

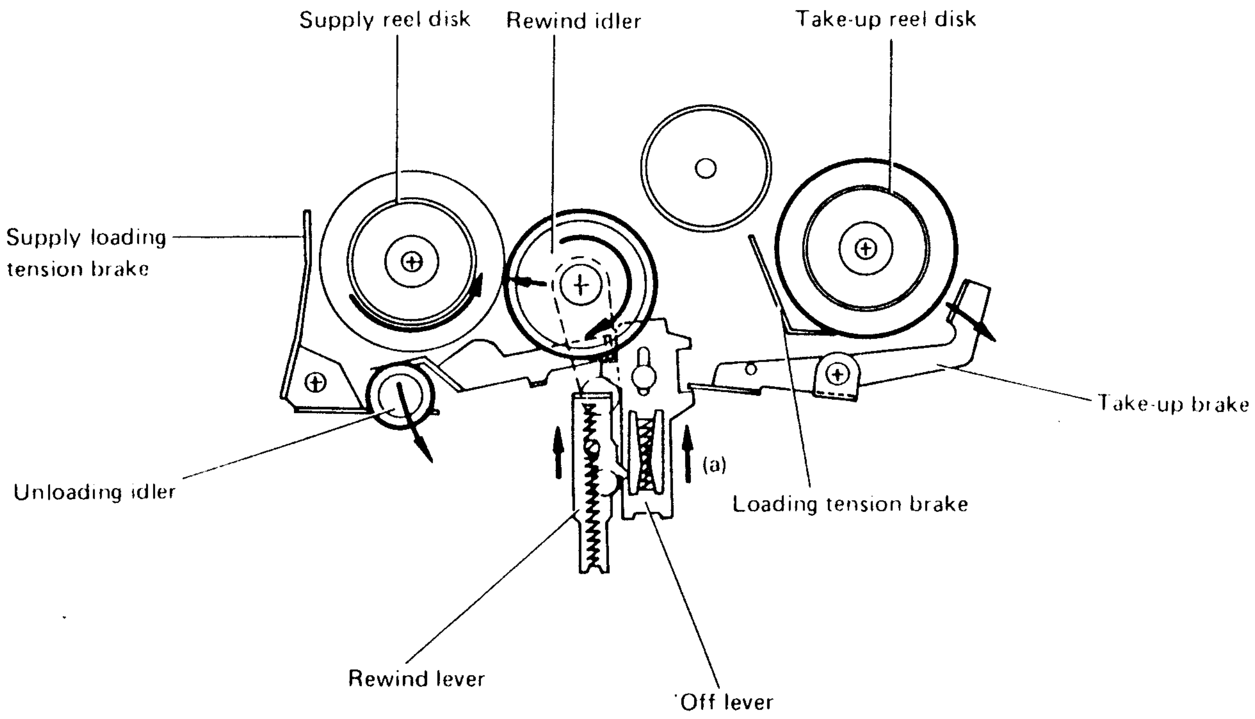
Supply reel disk
Rewind idler
Take-up reel disk
Supply loading tension brake
Take-up brake
(a)
Unloading idler
Loading tension brake
Rewind lever
Off lever

Fig. 2-18 REW mode mechanism

2-12 AUTO STOP MECHANISM

When the automatic stop system operates, the stop solenoid is energized. As a result, the lever of solenoid moves into the stop ring and it is rotated in the direction of arrow (a) by the stop ring rotation. As a result, the lock plate of function ass'y is pushed in the direction of arrow (c) by the stop lever and the function keys is released. See Fig. 2-19.

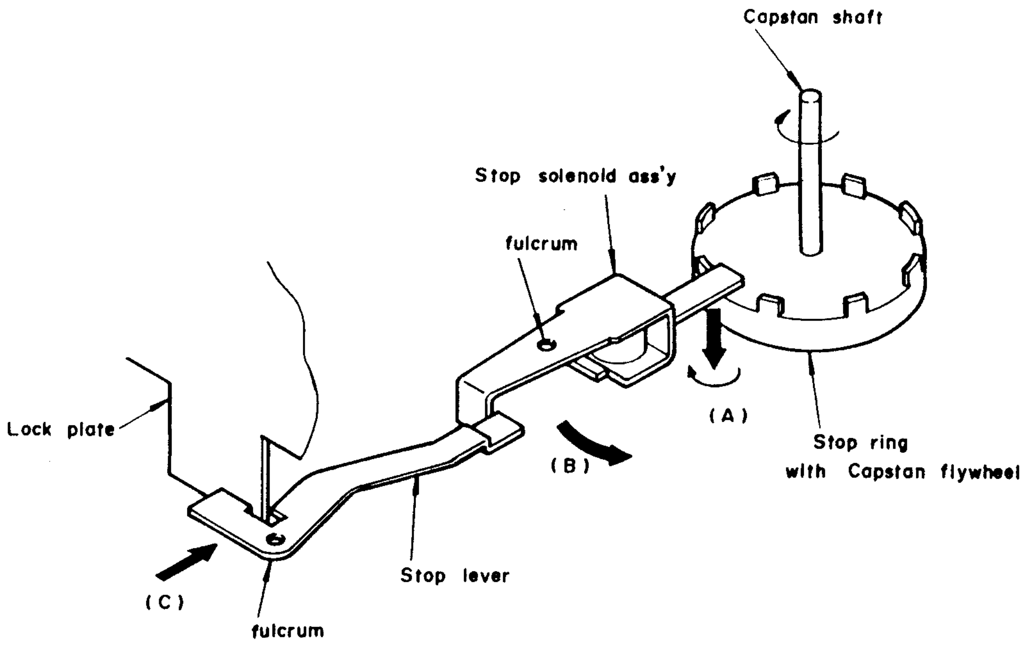
Capstan shaft
Stop solenoid ass'y
fulcrum
Lock plate
(B)
(A)
Stop ring with Capstan flywheel
Stop lever
(C)
fulcrum

Fig. 2-19 Auto stop mechanism

2-13 PAUSE MODE MECHANISM

When the PAUSE key is depressed in Record mode, the pinch roller solenoid is de-energized. The pinch roller slide plate-2 is returned to arrow (A) direction by the spring on the pinch roller cancel lever.
Then, the pinch roller is released from the capstan shaft. On the other hand, the take-up idler ass'y is released from the take-up reel disk by the take-up off lever.
Also the adjust plate is pressed against the take-up reel disk by the spring (2), supply brake arm ass'y is pressed to the supply reel disk. In this condition, tape traveling is stopped.

When the PAUSE key is depressed again, the pinch roller solenoid is energized. At that time, the unit return to Record mode.

NOTE: The VP-7100EG/EK memorizes the function mode when the DC power source is cut-off. Therefore, when the DC power source is cut-off during recording, and afterward turned on, Record mode is still effective. The recording will start again without the unloading-loading cycle.

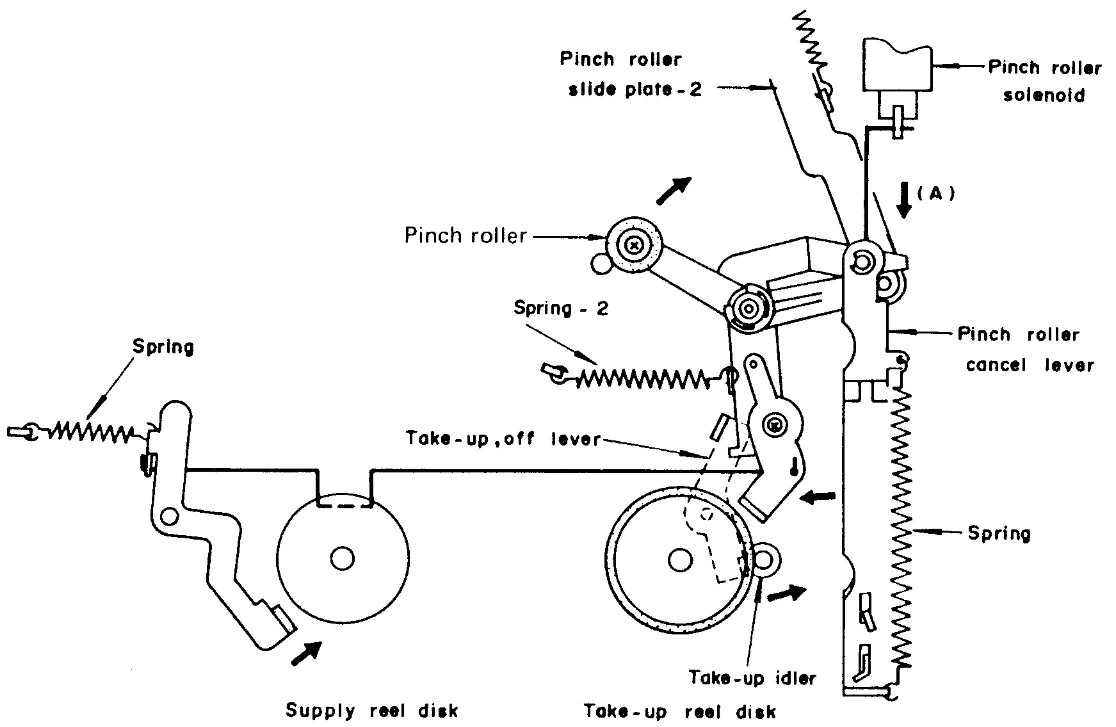

Fig. 2-20 Pause mode mechanism

SECTION 3

CIRCUIT DESCRIPTION

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3-1 GENERAL

The electronic circuit in this model is divided into seven major circuit boards; Preamplifier and Record amplifier, Luminance (Y) and Color amplifier, Audio and Drum Servo, Regulator and Capstan Servo, Mechanism control, Operation and Connector circuit boards.
Since the electronic circuitry must be assembled within a limited space, a number of IC's are employed, and the circuit design used in common for the recording and the playback circuit makes the best use of the limited psace.

3-2 VIDEO SYSTEM

3-2-1 General

In this video cassette recorder, video signals are recorded on a magnetic tape by two rotary video heads. For playback, video signals are re-generated from the magnetic tape through the same video heads. However, it is a general characteristic of magnetic heads that the current generated in playback is proportional to the flux field. Fig. 3-1 illustrates this principle.
The roll-off at higher frequencies is caused by a combination of factors: gap loss (wavelength approaching gap length), tape losses, etc.
For a number of reasons, including the overall bandwidth of the signal, tape limitations and playback characteristics, recording a video signal directly is not feasible. Therefore, the VP-7100EG/EK converts the input video signal to an FM signal before recording. It is necessary, of cource, to demodulate the FM in playback. In a unit of this size, it is difficult to maintain the time-base stability necessary to permit direct recording of the chroma signal. The effects of this instability are minimized by processing the luminance and chrominance separately. Refer to Fig. 3-2.

The luminance signal is frequency modulated between the limits: 3.8 MHz for sync tip and 4.8 MHz for peak white. The chroma signal is separated from the luminance by a band-pass filter. The subcarrier is then converted from 4.43 MHz to 626.9 kHz, linearly mixed with the FM luminance signal and directly recorded as a sideband of 626.9 kHz. The FM signal also functions as an AC bias for 626.9 kHz colour signal. In playback, those signals are separated by filter networks and processed individually. The FM luminance signal is demodulated, while chroma subcarrier is converted back to 4.43 MHz. Automatic colour correction circuitry minimizes hue and chroma amplitude variations before the signals are recombined. The output signal is PAL-type. An explanation of the block diagram and details of the circuit are as follows. Refer to the overall block diagram and the appropriate schematic diagram in Section 10.

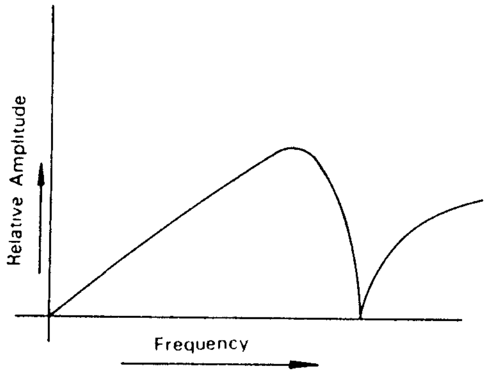
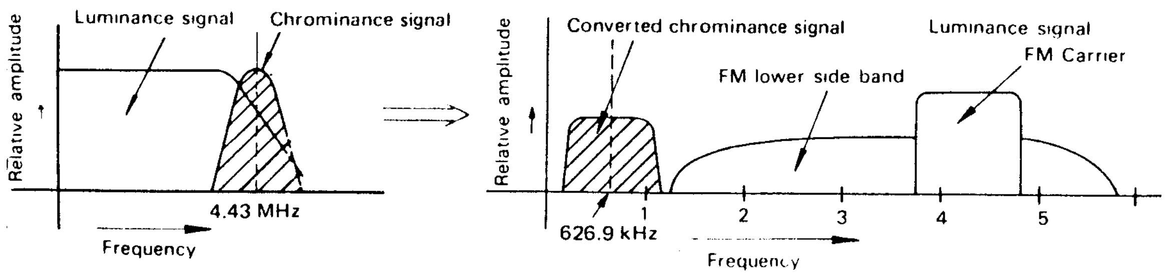


Fig. 3-1 Characteristic response curve for playback head



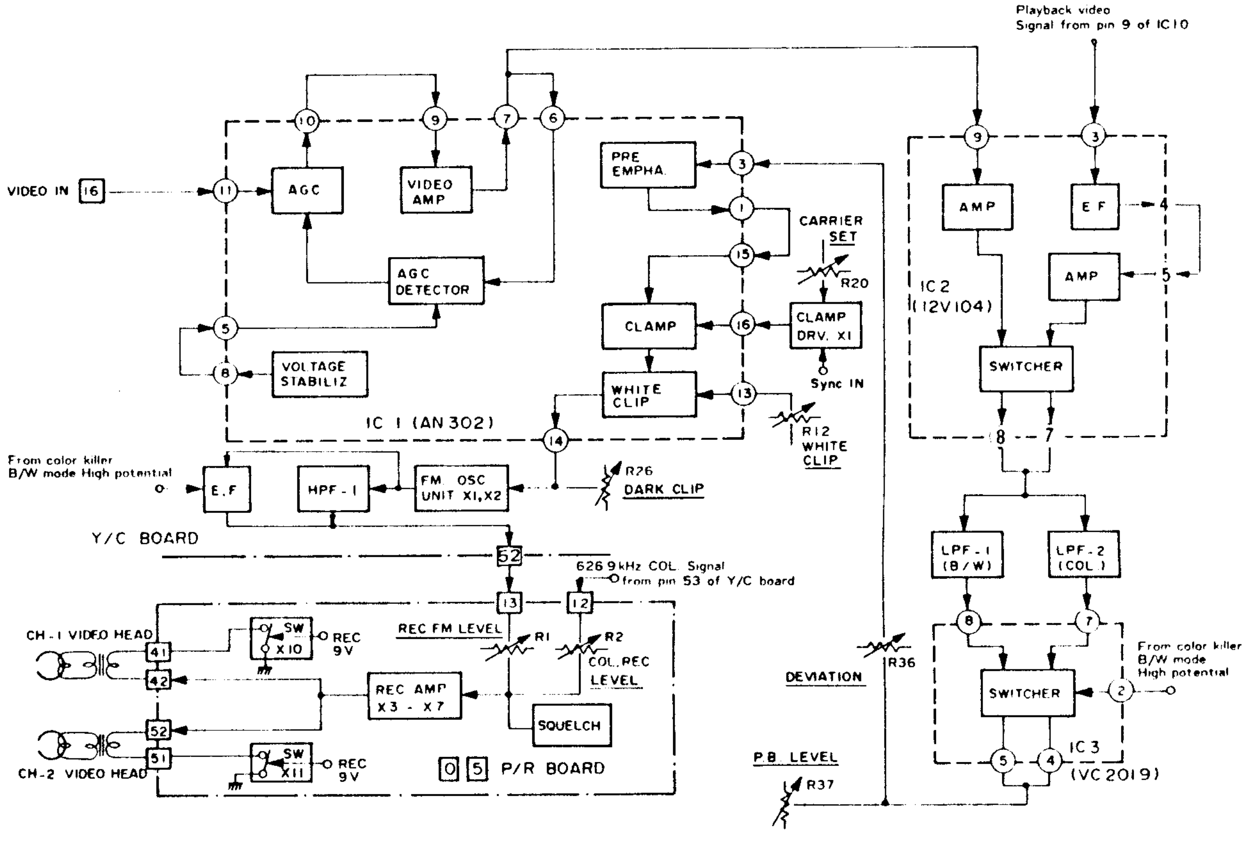
(A) PAL spectrum

(B) Modulated FM spectrum

Fig. 3-2

3-2-2 Luminance signal recording system

Refer to Fig. 3-3, Block diagram of the luminance signal recording system. The input video signal is kept at a constant level by utilizing an AGC (Automatic Gain Control) circuit, in IC1, so that a constant level may be maintained in spite of fluctuation of input level. This video signal is fed to pin 9 of IC2, AMPLIFIER and SWITCHER. This switcher selects the video signal either record mode or playback mode by PB 9V DC power supply or REC 9V DC power supply.
Then video signal is fed to the LPF-1 and LPF-2.
Integrated Circuit IC3 (VC2019) is an electronic switch. It performs change-over of the video signal between colour and black-and-white controled by the DC power supply (B/W mode High potential) to pin 2 of IC3.
In the case of the colour mode, pin 4 and pin 7 of IC3 becomes conductive, so that the signal fed through the LPF-2 (Low Pass Filter-2) which rolls off at 3.38 MHz will pass through the IC3.
However, in the case of the Black-and-white mode, pin 8 and pin 5 of IC3 becomes conductive by B/W mode DC power supply. So the signal passing through the LPF-1 which rolls-off at 4.1 MHz will pass through SWITCHER of IC3.
After passing through the R36 (DEVIATION), this luminance signal is supplied to pin 3 of IC1 (AN302) PRE-EMPHASIS to improve the signal to noise (S/N) ratio of the video signal. (Pre-emphasis of high frequencies, and later de-emphasis in demodulation, improves the S/N ratio since much noises exist in the high frequencies.)
The pre-emphasized signal is clamped at the sync tip by a clamping circuit, at a level determined by R20 (CARRIER SET) for a 3.8 MHz and peak white level determined by R36 (DEVIATION ADJ) for 4.8 MHz. This is done to prevent drift of the FM carrier caused by variations in the mean DC level of the video signal.


Playback video Signal from pin 9 of IC10
VIDEO IN 16
11
10
9
7
6
AGC
VIDEO AMP
AGC DETECTOR
5
8
VOLTAGE STABILIZ
IC 1 (AN302)
PRE EMPHA.
3
1
15
16
13
14
CARRIER SET
R20
CLAMP
CLAMP DRV. X1
Sync IN
WHITE CLIP
R12 WHITE CLIP
From color killer B/W mode High potential
E.F
HPF-1
FM OSC UNIT X1,X2
R26 DARK CLIP
Y/C BOARD
52
626.9kHz COL. Signal from pin 53 of Y/C board
13
12
CH-1 VIDEO HEAD
41
42
52
51
CH-2 VIDEO HEAD
SW X10
REC 9V
SW X11
REC 9V
REC FM LEVEL
R1
R2
COL.REC LEVEL
REC AMP X3 - X7
SQUELCH
0 5 P/R BOARD
AMP
E F
AMP
IC2 (12V104)
SWITCHER
4
5
8
7
LPF-1 (B/W)
LPF-2 (COL.)
DEVIATION
R36
SWITCHER
From color killer B/W mode High potential
2
4
5
IC3 (VC2019)
P.B. LEVEL
R37

KEY TO ABBREVIATIONS:

BPF : Band Pass Filter
DRV. : Drive
E.F. : Emitter Follower
EMPHA: Emphasis
HPF : High Pass Filter
LPF : Low Pass Filter
MOD. : Modulator

Fig. 3-3 Block diagram of luminance signal recording system

The high frequency boost resulted by pre-emphasis causes overshoot in areas of rapid change of signal level. To prevent overdeviation of the modulator, dark and white clip circuits are used. The output signal of the white clip circuit is fed to the FM modulator, a kind of astable multivibrator.

The modulator was designed to operate at 3.8 MHz at the sync tip and 4.8 MHz at peak-white level.

This modulated FM signal is fed through the high-pass filter (H.P.F.) where all frequencies below approximately 1.4 MHz are eliminated from the spectrum.

After passing through the emitter follower X8, the modulated signal is supplied to the Pre/Record amplifier printed circuit board. Then, at the mixer, this signal is mixed with the converted chroma signal from the colour amplifier. The mixed signal is amplified by the record amplifier and coupled through the rotary transformer to the video head.

1. AGC (Automatic Gain Control), AGC DETECTOR -- (IC1, AN302)

The signal from the video input passes through AGC and the Video Amplifier and reaches pin 7 of IC1, which is the AGC output. The signal of AGC output transmitted to the RLC-1, to eliminate the 4.43 MHz colour components, and then supplied to the pin 6 of IC1 which is connected with AGC DET (detector).

The AGC DET (detector) rectifies the video signal from the VIDEO AMP. This DC current is used for a DC bias current of detector.

The AGC is differential type and AGC DET (detector) supplies reference DC current.

2. SWITCHER (IC2), LPF-1, LPF-2, SWITCHER (IC3)

Integrated Circuit IC2 (12V 104) is an AMPLIFIER and SWITCHER. It performs change-over of the output video signal of IC2, by PB 9V DC power supply or REC 9V DC power supply.

Refer to Fig. 3-4.

In the case of the record mode, the REC 9V DC power is supplied to pin 11 of IC2, so that the video signal from AGC out (pin 7 of IC1) appears at pin of IC2.

In the case of the playback mode, playback video signal from pin 9 of IC10 is fed to pin 3 of IC2 and PB 9V power is supplied to pin 2 of IC2, so that the video signal appears at pin 7 of IC2.

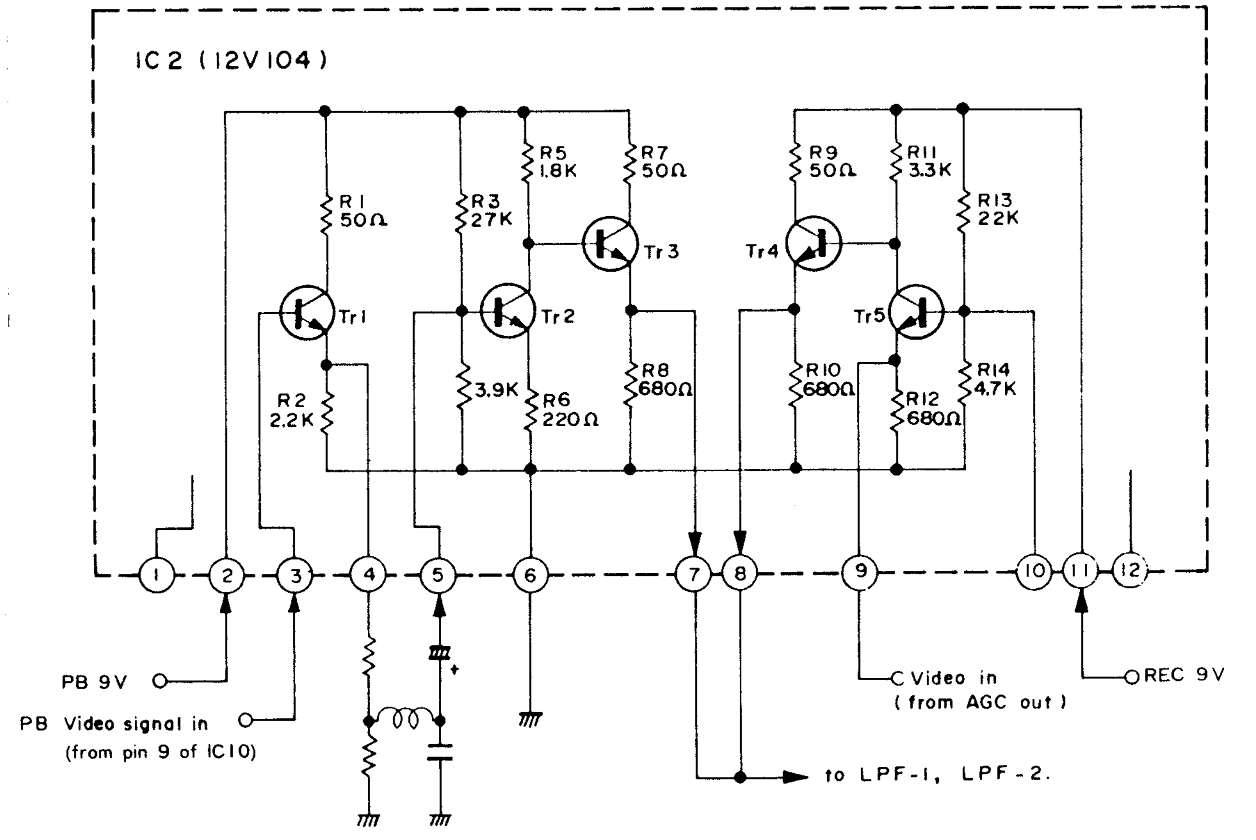

IC 2 (12V104)
R5 1.8K
R7 50Ω
R9 50Ω
R11 3.3K
R1 50Ω
R3 27K
R13 22K
Tr3
Tr4
Tr1
Tr2
Tr5
R2 2.2K
3.9K
R6 220Ω
R8 680Ω
R10 680Ω
R12 680Ω
R14 4.7K
1
2
3
4
5
6
7
8
9
10
11
12
PB 9V
PB Video signal in (from pin 9 of IC10)
Video in (from AGC out)
REC 9V
to LPF-1, LPF-2.

Fig. 3-4

Refer to Fig. 3-5, SWITCHER.

After passing through the SWITCHER (IC2), the video signal is supplied to LPF1, LPF-2 and SWITCHER (IC3).

Characteristics of LPF-1, LPF-2 are shown in Fig. 3-6.

Integrated Circuit IC3 (VC2019) is an electronic switch. It performs change-over of the video signal between colour and black-and-white, controlled by colour killer circuit. In the case of the colour mode, pin 2 of IC3 is grounded potential so that the video signal coming from pin 7 or 8 of IC2 is first supplied to LPF-2 (Low-Pass-Filter-2) which rolls off at 3.3 MHz will pass through the SWITCHER of IC3.

Also, LPF-2 has 0.9μs delaying function for adjusting the timing of colour signal and luminance signal. Then, this video signal is supplied to R36 (DEVIATION) at the record mode and R37 (PB LEVEL) at the playback mode. In the case of the black-and-white mode, pin 2 of IC3 is charged with the Black-and-White mode 9V DC power supply, so that the video signal from pin 7 or 8 of IC2 fed through LPF-1 which rolls off at 4.1 MHz will pass through the SWITCHER of IC3.

Then, this video signal is supplied to R36 (DEVIATION) at the record mode and R37 (PB LEVEL) at the playback mode.

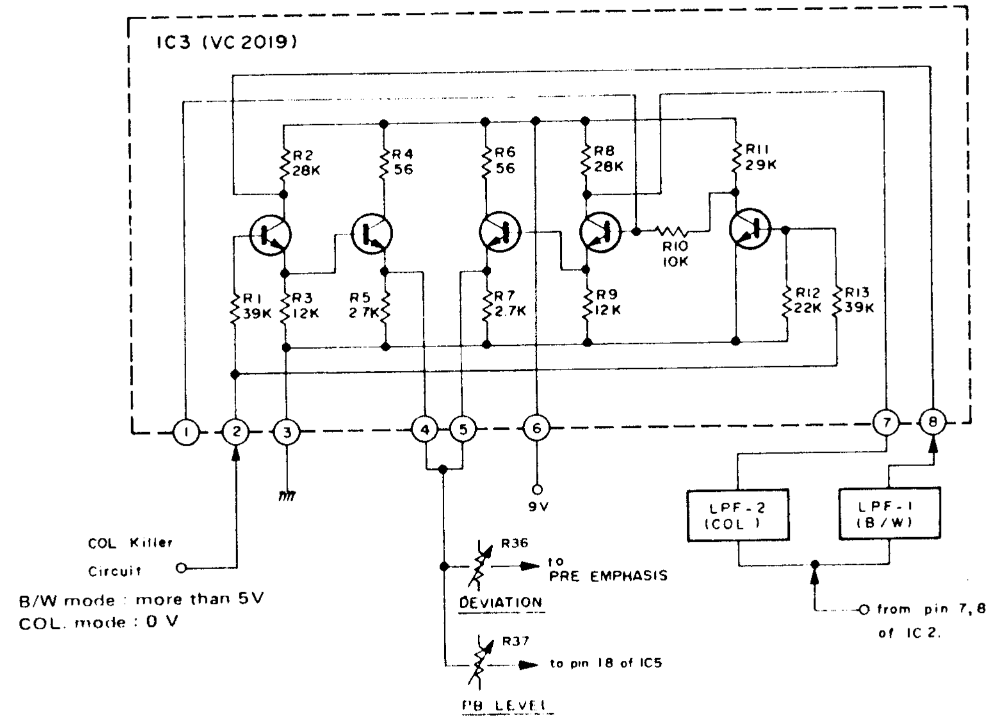

IC3 (VC 2019)
R2 28K
R4 56
R6 56
R8 28K
R11 29K
R10 10K
R1 39K
R3 12K
R5 2.7K
R7 2.7K
R9 12K
R12 22K
R13 39K
1
2
3
4
5
6
7
8
9V
COL Killer Circuit
B/W mode : more than 5V
COL. mode : 0 V
R36
to PRE EMPHASIS
DEVIATION
R37
to pin 18 of IC5
PB LEVEL
LPF-2 (COL)
LPF-1 (B/W)
from pin 7, 8 of IC 2.

Fig. 3-5

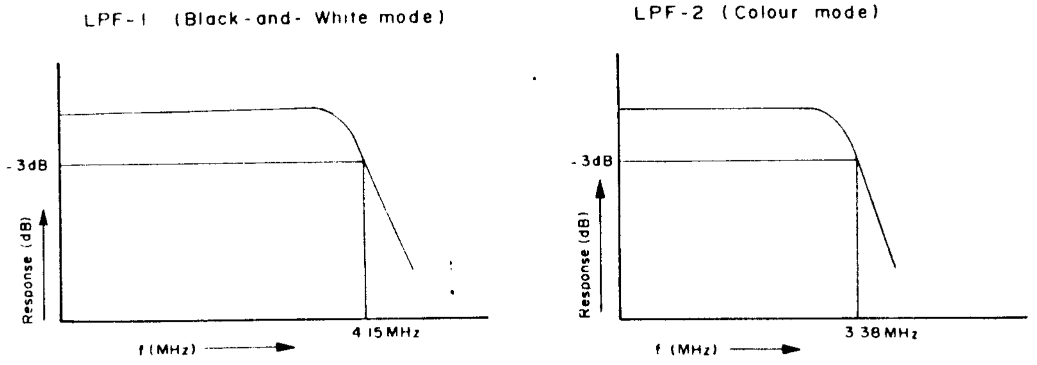


Fig. 3-6 Characteristic of LPF-1 and LPF-2

3. PRE-EMPHASIS – IC1, AN302

The video signal which has just passed through LPF-1 or LPF-2 is adjusted in level at the deviation adjuster, (R36) then is supplied to the Pre-emphasis circuit which improves the signal-to-noise (S/N) ratio of the video signal. In general, FM modulated signals are influenced in amplitude and phase by noise. And also, the higher the frequency is, the more it is affected and has S/N deterioration upon demodulation.
Pre-emphasis of this model functions more strongly than that of conventional 3/4"-VCRs. For, this model requires much more consideration on S/N ratio than for conventional ones because of its unique high density recording system.
Pre-emphasis is decided by the frequency characteristic of the feedback loop from pin 1 of IC1 to pin 2 of IC1.

4. CLAMP, WHITE CLIP and DARK CLIP

The pre-emphasized video signal is supplied to pin 15 of IC1, CLAMP, which makes the sync tip hold constant potential accurately so that sync tip may be at 3.8 MHz upon FM modulation.
The pre-emphasis or high frequency boost causes overshoot or undershoot, it is difficult to clamp the signal at sync tip. Therefore, exact sync tip clamping is made by switching circuit X3 (Clamp Drive).
To prevent over-deviation of the modulator, dark and white clip circuit are used. Dark clip is set by R26 (DARK CLIP) and the setting of R12 (WHITE CLIP) determines white clip level.
The signal treated as above is supplied to FM modulator.
Reference: In the case of overmodulation there frequently occurs AM phenomenon in the modulated wave, which causes reverse of black and white and deterioration of S/N ratio.

5. FM MODULATOR

The video signal from the White and Dark Clippers is supplied to FM MODULATOR. The FM modulator is a kind of unstable multivibrator with input voltage determined by the video signal.
The oscillation frequency of the FM modulator is shown by the following formula:

$$f = \frac{1}{2CR \log_e \left(1 + \frac{E_o}{E_{in}}\right)}$$

f is frequency in cycles per second (Hertz).
E_{in} is input signal voltage.
RC is the time constant of base charging circuit.
E_o is power supply voltage.
The modulator was designed to operate at 3.8 MHz at the sync tip and 4.8 MHz at the white peak as shown in Fig. 3-7.
The FM modulator is unified and there are feed-through type capacitors (signal part: 22 pF, power source part: 1000 pF) at the input and output terminals. Which prevent the signal from breaking out of the FM modulator.
D3 and D4 are temperature compensating diodes.
Then the FM-modulated signal is supplied to HPF (High Pass Filter).

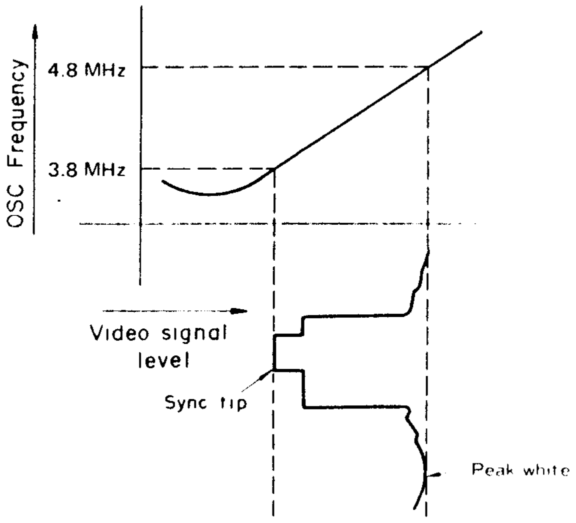


Fig. 3-7 Video to FM transfer characteristics

6. HPF-1 (High Pass Filter)

HPF (High Pass Filter) functions in attenuating the part which lower side bands of FM frequencies generated by FM modulation fall on lower band of converted colour signal. The modulator output is couped across a high pass filter which eliminates the part (all signals in the spectrum below approximately 1.4 MHz) which are lower than sidebands of FM modulation.
The FM signal that passed through HPF is supplied to X8 (Emitter Follower) which makes the signal low impedance and sends it to the Preamplifier/Record amplifier circuit board.

7. REC AMP (Recording Amplifier), SQUELCH

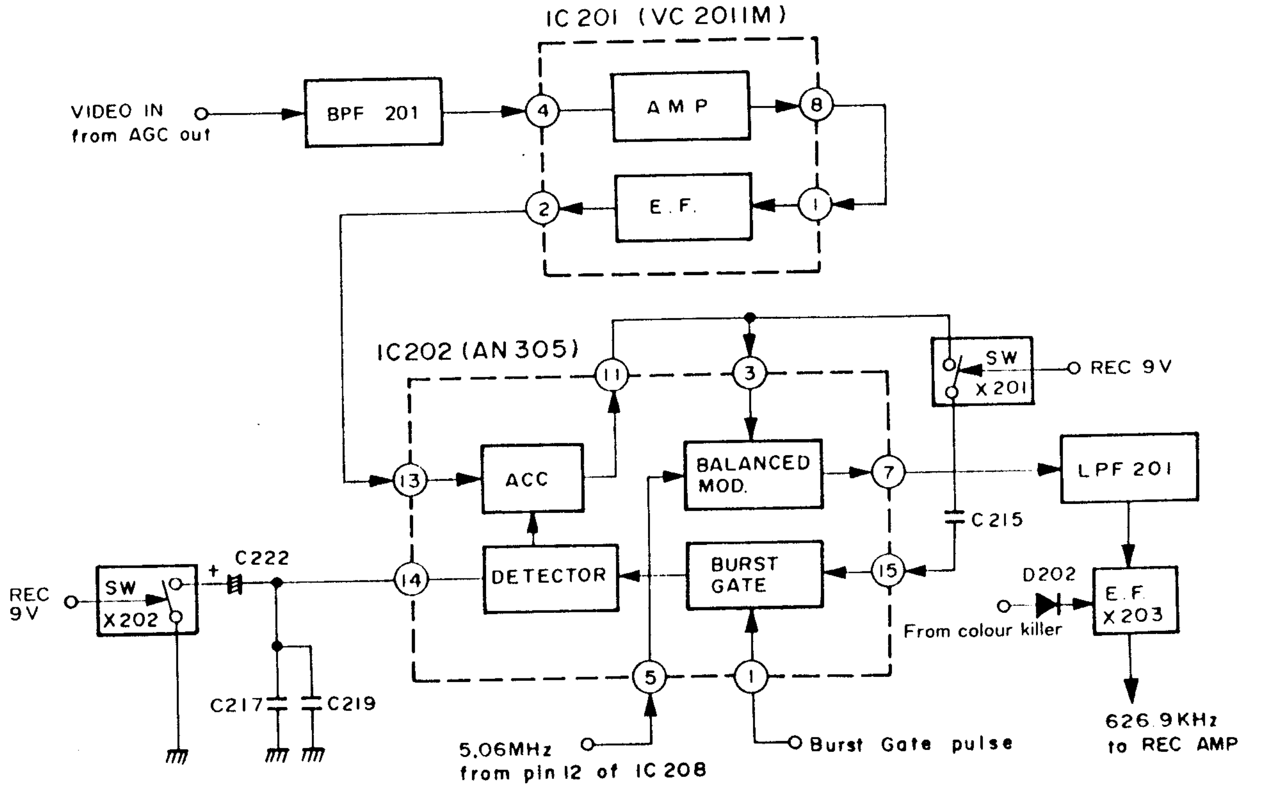
The FM modulated signal is supplied to Preamplifier and Recording amplifier circuit from X8, X9 of Luminance and colour amplifier circuit, then mixed with the converted chroma signal (626.9 kHz) at the Preamplifier and Record amplifier circuit. Transistors X1 and X2 in the Record amplifier constitute a squelch circuit controlled by After Loading (AL) 12V power supply.
The FM modulated signal is not supplied to recording amplifier for about 3 s after loading is completed, by the squelch circuit. This avoids mis-erasing of recorded signal, which is apt to happen when a tape travelling is not completed.

3-2-3 Colour signal recording system

Refer to Fig. 3-8.
The chroma signal is separated from the video signal by the band-pass-filter (BPF-201). This chroma signal is amplified by IC201, supplied to emitter follower (EF) which provides a low impedance drive, then supplies to ACC (Automatic Colour Control) circuit. The output ACC (Automatic Colour Control) is kept at a constant level, then supplied to the balanced modulator. At the balanced modulator the subcarrier is converted by mixing the colour signal of 4.43 MHz and 5.06 MHz.
The output of the balanced modulator is the sum and difference frequencies of both input signals. They are fed to the LPF and only the difference frequency (626.9 kHz) is pressed. Then the chroma signal is mixed with the luminance signal at the recording amplifier, and fed to the video head.

1. BPF-201 (Band-pass-filter), AMPLIFIER, EF (Emitter Follower)

The video signal from pin 7 of IC1 (AGC output) is supplied to band-pass-filter (BPF-201). See Fig. 3-9. The band-pass-filter eliminates any residual luminance component in the signal and allows only the 4.43 MHz subcarrier and 500 kHz modulation to be passed to pin 4 of IC201 (amplifier).
Refer to Fig. 3-8.
The output of the amplifier, pin 8 of IC7, is connected. After passing through the emitter follower, the chroma signal is supplied to pin 13 of IC202, ACC (Automatic Colour Control) circuit.



KEY TO ABBREVIATIONS:
ACC : Automatic Colour Control
BPF : Band Pass Filter
E.F. : Emitter Follower
LPF : Low Pass Filter
SW : Electronic Switch

Fig. 3-8 Block diagram of colour signal recording system

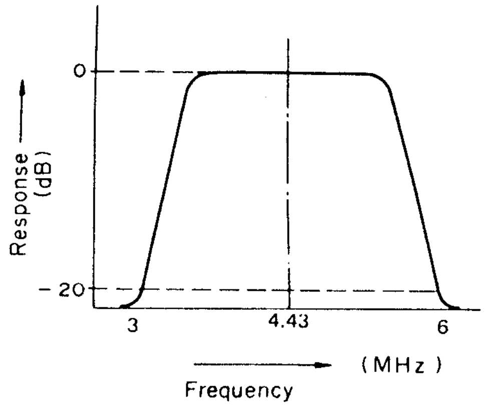


Fig. 3-9 Characteristic of BPF-201

2. ACC, ACC DETECTOR-IC202 (AN305)

Refer to Fig. 3-8.

This ACC is peak-type and maintains the level of the 4.43 MHz colour signal constant in record mode and the playback mode. In the record mode colour signal from pin 11 of IC202 (ACC output) is supplied to pin 15 of IC202 BURST GATE through C215 because X201 (SW) is turned on by the REC 9V DC power supply. At the same time, the burst gate signal is supplied to the pin 1 of IC202, so that the burst signal is separated at the BURST GATE and then, this signal is supplied to the ACC detector (DETECTOR).

At the ACC detector (DETECTOR), the peak level of the burst signal is picked out and rectified to DC voltage change as a control voltage. That is a burst level change is detected as a DC component change so that the ACC output is automatically controlled at the constant level.

In recording mode, transistor X202 turns on, so that the pin 14 of IC202 connected with C217, C219 and C222. That is a time constant of ACC detector.

In playback mode, the chroma signal from pin 1 of IC203 is supplied to pin 15 of IC202, and the burst pulse is supplied to pin 1 of IC202. The burst signal is picked out at the GATE, and sent to the detector (DET.).

At the detector, the burst level change from the burst gate is detected as a DC component change, and sent to the ACC as a control voltage. Also, transistor X202 is turned off so that the time constant of detector is determined by C219 and C217.

3. BALANCED MODULATOR (IC202) – LPF-201, E.F.

Integrated circuit IC202 is a frequency converte; the 4.43 MHz subcarrier is fed to pin 3 of IC202 from ACC circuit and the 5.06 MHz CW is fed to pin 5 of IC202. As a result, both sum and difference frequencies will be seen in pin 7 of IC202 as shown in Fig. 3-10.

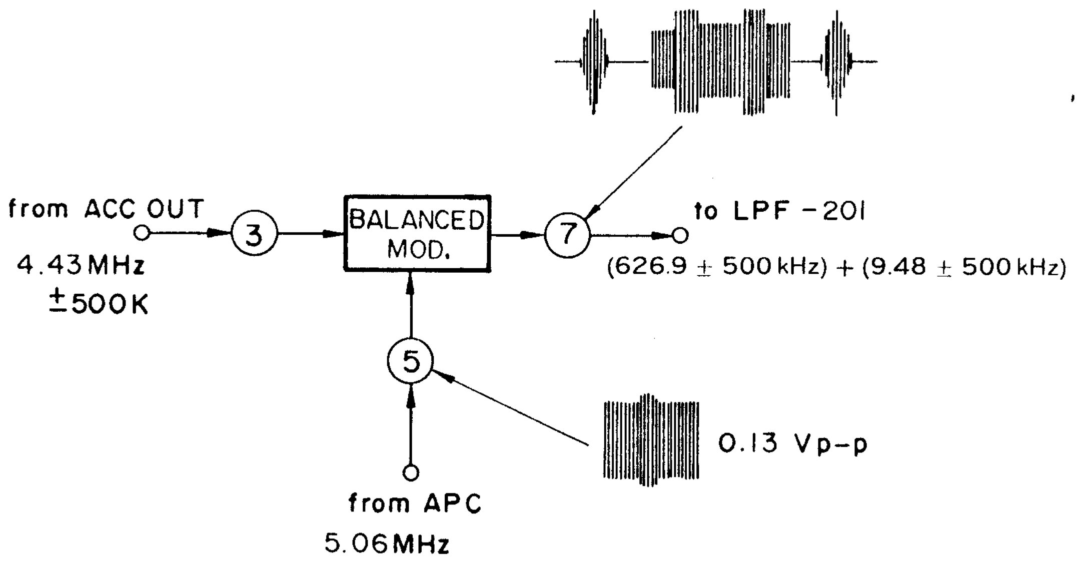

from ACC OUT
4.43 MHz
±500K
3
BALANCED MOD.
7
to LPF -201
(626.9 ± 500 kHz) + (9.48 ± 500 kHz)
5
0.13 Vp-p
from APC
5.06 MHz

Fig. 3-10 Main converter

Sum frequencies component . . 9.49 MHz ± 500 kHz
Difference frequencies
component. . . . . 626.9 kHz ± 500 kHz

Both signals 9.49 MHz and 626.9 kHz, are presented at the input of LPF-201 (Low-Pass Filter) which rolls off at approximately 1.5 MHz. This means that only the 626.9 kHz is obtained at the output of LPF-201.

In the VP-7100EG/EK the phase-shift-colour recording system has been adopted, which rotates phase of the colour signal –90° every 1-H for CH-2 video head at the recording, so that the 5.06 MHz signal from APC is as follows:

5.06 MHz ± F (F : phase rotation)

Therefore the converted frequency is:

$$(5.06\text{ MHz} + F) - (4.43\text{ MHz} \pm 500\text{ kHz})$$
$$= 626.9\text{ kHz} \pm F \mp 500\text{ kHz}.$$

According to the above, it will be clear that the phase of low frequency converted chroma signal is rotated –90° for CH-2.

The output signal of LPF-201 is sent to the emitter follower (X203), then sent to the pre-amplifier and record amplifier board.

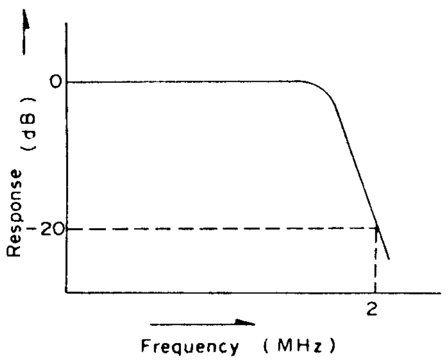
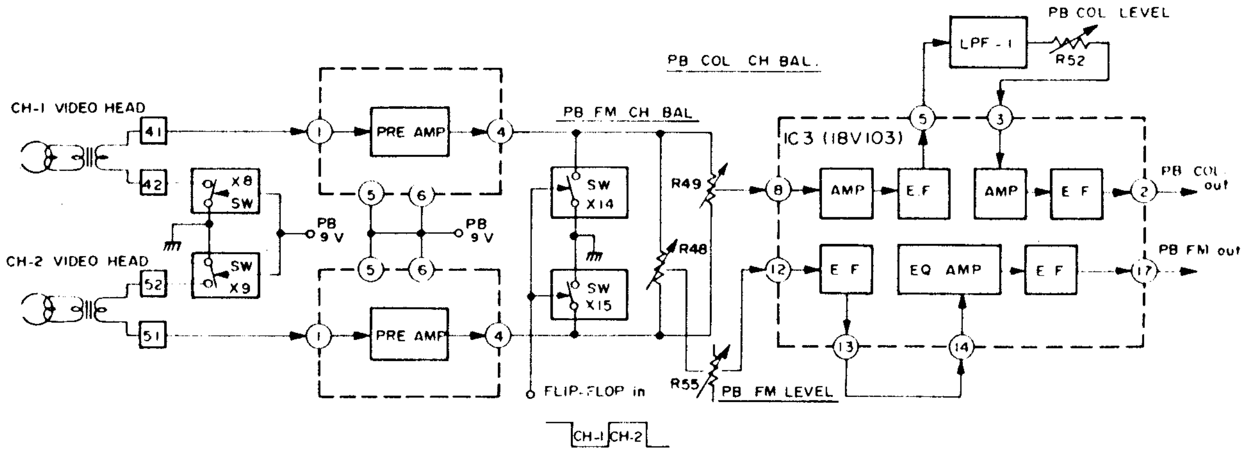


Fig. 3-11 Characteristic of LPF-201

3-2-4 Luminance and colour signal playback system

Refer to Fig. 3-12.

During playback the regenerated FM signal from both video heads is amplified by the preamplifier, IC1 and IC2 (PRE/REC board) of CH-1 and CH-2. The pre-amplifiers are switched by a symmetrical square-wave


PB COL LEVEL
LPF - I
R52
PB COL CH BAL.
CH-I VIDEO HEAD
41
42
PRE AMP
1
4
PB FM CH BAL
5
3
IC3 (18V103)
X8 SW
5
6
PB 9V
PB 9V
SW X14
R49
8
AMP
E.F
AMP
E F
2
PB COL out
CH-2 VIDEO HEAD
52
51
SW X9
5
6
R48
SW X15
12
E F
EQ AMP
E F
17
PB FM out
PRE AMP
1
4
13
14
FLIP-FLOP in
R55
PB FM LEVEL
CH-1
CH-2

KEY TO ABBREVIATIONS:
COL. : Colour
EQ. : Equalizer
LPF : Low Pass Filter
SW : Electronic Switch

Fig. 3-12 Block diagram of luminance and colour signal playback system-1

generated by two fixed magnets on the rotary head drum assembly. This switching permits the two FM signals to be combined. The output of the FM switching (SW) is sent to the luminance equalizer (IC3), then sent to the luminance demodulator circuit on the luminance/colour circuit board.
On the other hand, the chroma signal is supplied to the LPF-1 (low-pass filter) after passing through the colour amplifier IC3. Only the 626.9 ± 500 kHz chroma signal passes through the LPF-1. After the colour signal level determined by R52 (P.B. COL. LEVEL). This signal is amplified by colour amplifier IC3, then sent to the luminance/colour circuit board.

1. PRE-AMPLIFIER

The playback signal obtained from a tape is approximately 1 – 2 mV in amplitude. This very low amplitude requires the circuit used as a preamplifier to be the high gain, low noise variety.
The signal is coupled across a rotary transformed to pin 1 of IC1. Capacitors C18 and C19 are adjusted to match the impedance of the video heads to the input circuit. Integrated circuits IC1 and IC2 constitute a pre-amplifier with cascade configuration which provides the high gain, low noise characteristic necessary. Figure 3-13 shows the overall response characteristics of the preamplifier.
The output from then are fed to the switcher X14, X15.

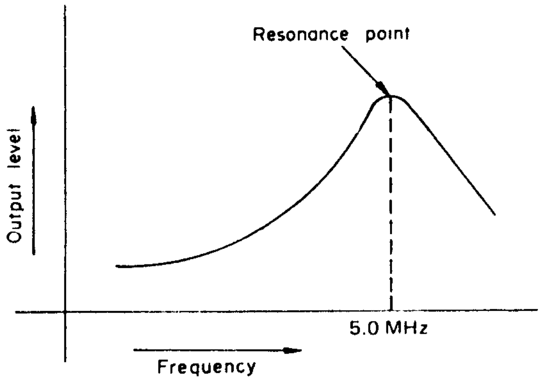
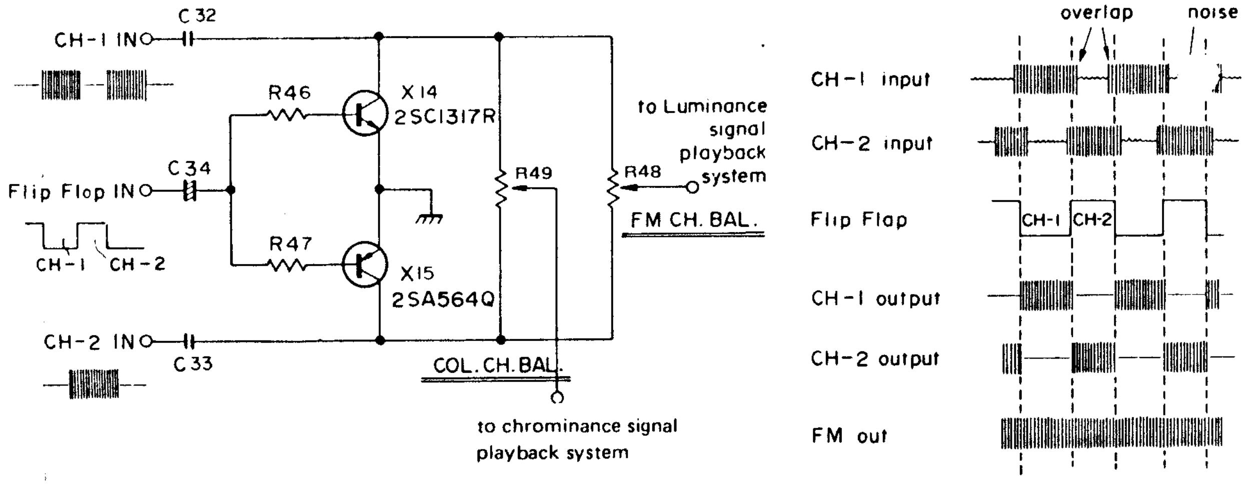


Fig. 3-13 Frequency response of the pre-amplifier

2. SWITCHES (SW) X14 and X15

The VHS is a two-head helical scan machine. During record, each head is actually in contact with the tape for more than 180°, so each recorded video track is longer than one field. In playback it is necessary to switch from one head to the other, without mixing the FM signals.
Playback switching is illustrated in Fig. 3-14.


C32
CH-1 IN
R46
X14
2SC1317R
C34
Flip Flop IN
CH-1
CH-2
R47
X15
2SA564Q
CH-2 IN
C33
R49
R48
to Luminance signal playback system
FM CH. BAL.
COL. CH. BAL.
to chrominance signal playback system
overlap
noise
CH-1 input
CH-2 input
Flip Flop
CH-1
CH-2
CH-1 output
CH-2 output
FM out

(a)

(b)

Fig. 3-14 FM switching system

A signal is applied from CH-1 and CH-2 with every rotation of the video heads. Since mixing two FM signals presents may difficulties, a continuous signal is formed by the switching method.
The tape wrap in the drum is slightly more than 180° so there is a little overlap on the playback signal. Switching is accomplished as follows: Approximately 5-H before the leading edge of vertical sync, one channel has almost completed its signal path and the other is just beginning.
At this time 25-cycle square waves change polarity on the bases of the X14 and X15. When a positive part of gate pulse is applied to the base of X14, transistor X14 is turned on and shorts any signal on the collector to ground. However, transistor X15 is turned off by this positive gate pulse and any signal at the collector is passed to the resistive mixing network.

3. COLOUR AMP (IC3), LPF-1

After passing through the R49 (COLOUR CHANNEL BALANCE) the playback chroma signal is amplified by the Colour Amp (IC3), then sent to LPF-1 (Low-Pass-Filter).

The low-pass-filter eliminates all signals in the spectrum above approximately 1.5 MHz.
After passing through R52 the remaining signal 626.9 kHz ± 500 kHz is sent to colour circuit on the luminance and colour printed circuit board.

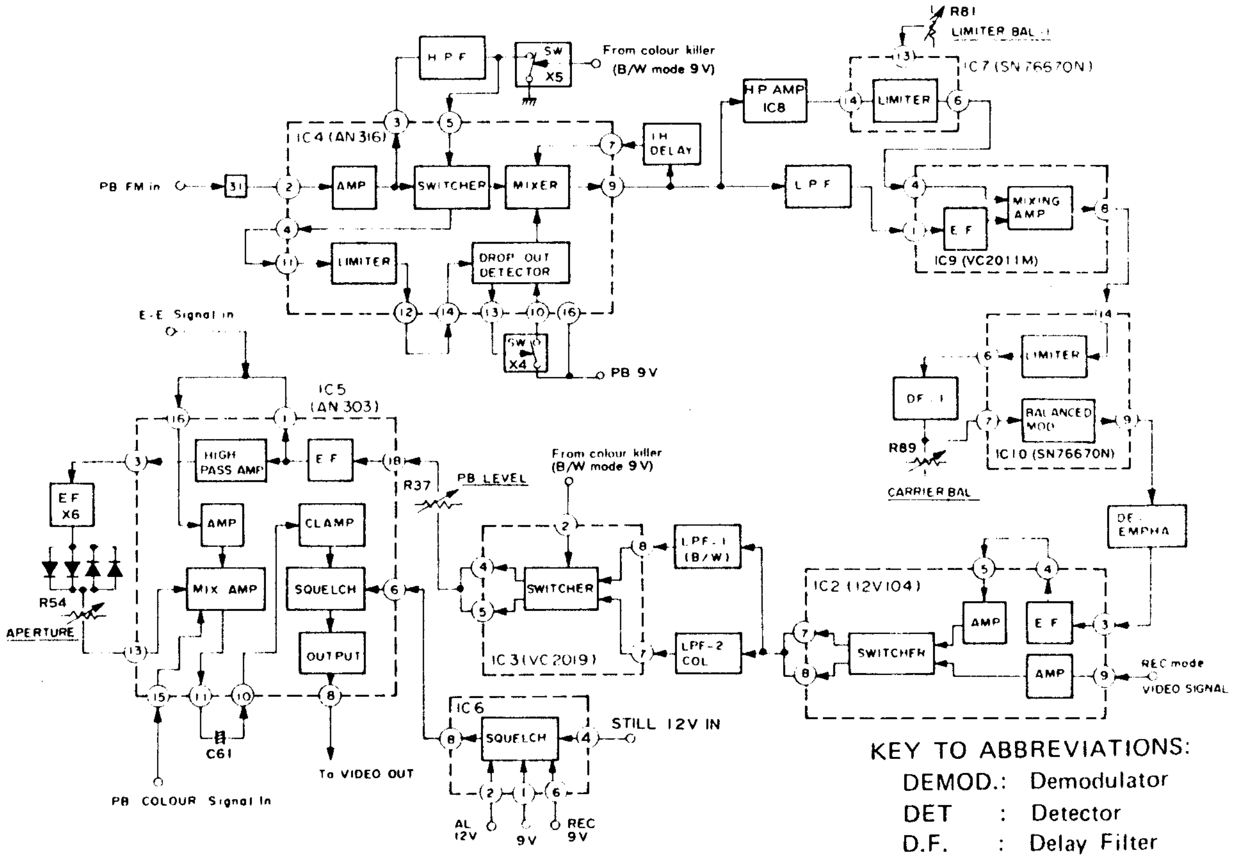
R55 (PB FM LEVEL) is a potentiometer for playback FM level.

R52 (P.B. COL. LEVEL) is a potentiometer for a playback colour level.

L6 (820μH) and C39 (0.0056) are traps to check interference of audio bias at the after-recording.

3-2-5 Luminance signal reproduction system

Refer to Fig. 3-15.
The FM playback signal from the preamplifier is fed to an HPF after passing through the amplifier IC4. The HPF eliminates the chroma signal then sent to the Mixer. The D.O.C. (Drop-out Compensator) eliminates drop-out caused by the loss of the FM signal due to damage or scratches on the magnetic tape.


H P F
SW
X5
From colour killer (B/W mode 9 V)
IC4 (AN 316)
1H DELAY
PB FM in
AMP
SWITCHER
MIXER
LIMITER
DROP OUT DETECTOR
E-E Signal in
SW X4
PB 9V
IC5 (AN 303)
HIGH PASS AMP
E F
EF X6
AMP
CLAMP
MIX AMP
SQUELCH
OUTPUT
R54
APERTURE
C61
PB COLOUR Signal In
To VIDEO OUT
R37
PB LEVEL
From colour killer (B/W mode 9 V)
SWITCHER
LPF-1 (B/W)
LPF-2 COL
IC 3 (VC 2019)
IC6
SQUELCH
STILL 12V IN
AL 12V
9V
REC 9V
R81
LIMITER BAL.
IC7 (SN 76670N)
H P AMP IC8
LIMITER
L P F
MIXING AMP
E F
IC9 (VC2011M)
LIMITER
DF
BALANCED MOD
R89
IC10 (SN76670N)
CARRIER BAL.
DE-EMPHA
IC2 (12V104)
AMP
E F
SWITCHER
AMP
REC mode VIDEO SIGNAL

KEY TO ABBREVIATIONS:
DEMOD.: Demodulator
DET : Detector
D.F. : Delay Filter
E.F. : Emitter Follower
HPF : High Pass Filter
LPF : Low Pass Filter

Fig. 3-15 Block diagram of luminance signal reproduction system

After passing through the mixer, the FM signal is divided. The low component of the FM signal passes through a low-pass filter (LPF), and high component of the FM signal passing through H.P. AMP. The high component of FM signal is sent to limiter and mixed with the low component of the FM signal at the mixing amplifier IC9.

Although the signals have gone through several stages of limiting, the process of drop-out correction may introduce some additional amplitude variations. Therefore, a limiter is provided to remove amplitude variations entirely.

Integrated Circuit, IC10 (SN76670N) is a delay line type demodulator combined with DF-1 (DELAY FILTER), and demodulates the FM signal.

The demodulated signal is sent to a de-emphasizer which compensates its frequency characteristic (Contrary characteristic of pre-emphasis is recording), then sent to E.F. of IC2.

After passing through the AMP. IC2, signal sent to a SWITCHER which selects the playback signal path or record signal path. Then, this signal fed to LPF-1 and LPF-2.

Integrated Circuit, IC3 (VC2019) is an electronic switcher, when the colour signal appeared at pin 7 or 8 of IC2, video signal is first supplied to LPF-2 (Low-Pass-Filter) which rolls off at 3.3 MHz will pass through the SWITCHER of IC3.

When the black-and-white signal appeared at pin 7 or 8 of IC2, video signal is first supplied to LPF-1, which rolls off at 4.1 MHz will pass through the SWITCHER of IC3.

After passing through the SWITCHER, this video signal is determined its level by R37 (P.B. LEVEL), then sent to pin 18 of IC5, E.F.

After passing through R37 (P.B. LEVEL), the video signal is sent to the aperture, which compensates its higher frequencies.

The compensated video signal is mixed with the signal coming from IC5 (Amplifier) by IC5 (Mixing Amplifier) and also mixed with colour signal so as to be sent to the audio and servo circuit board as the video output signal. The video signal which passed through the mixing amplifier is clamped by IC5 (Clamper) and will finally be the video output after passing the squelch output.

Electronic-to-Electronic mode, the video signal from the AGC output is supplied to IC5 (Amplifier) and finally sent to the video output through the mixing amplifier, clamper and squelch output.

1. AMPLIFIER (AMP), HIGH PASS FILTER (HPF) and MIXER – IC4 (AN316)

Refer to Fig. 3-15.

This circuit eliminates drop-outs caused by the loss of the FM signal.

The playback FM signal is first supplied to pin 2 of IC4 to be amplified by an amplifier (AMP), then supplied to pin 3 of IC4. The amplified FM signal is supplied to the high-pass filter (HPF) made up of C37, C39 and L9 which passes through the FM signal component, then fed to pin 5 of IC4. The FM signal reaches pin 4 of IC4 after passing through a differential amplifier and an emitter follower, and then fed to pin 11 of IC4 after passing through C43, R40 and C46.

After passing through the limiter, the FM signal is fed to pin 12 of IC4 and supplied to pin 14 of IC4.

Then, the output signal of the drop-out detector of pin 13 of IC4 is sent through the low-pass-filter (LPF) made up of L10, C41 and C44, so a drop-out appears to be a pulse at the gate of X4 (Detector Drive) as a switching pulse.

This switching pulse is fed to pin 10 of IC4 drop-out detector (Drop-out Det). On the other hand, FM signal coming from pin 5 of IC4 is supplied to pin 9 of IC4 after passing through the emitter follower and the mixer. This output is always supplied through 1-H Delay Line (DL-1) to pin 7 of IC4. This 1-H delayed RF signal is mixed with the signal from the drop-out detector. Normally, the limiter and the drop-out detector circuit are not operating so that the delayed RF signal does not appear to the mixer. However, when a drop-out occurs, the drop-out detector sends a gate pulse to the mixer, so the delayed RF signal from the high-pass filter will appear at the mixer.

NOTE: DOC (Drop-out Compensator) detection sensitivity is decided according to the ratio of resistance distributions between R40 and R47.

2. Duplex Limiter circuit

As this model is designed to be affected more strongly by pre-emphasis than conventional models, so the FM modulated signal is apt to arise AM variation at the high frequency component of the video signal. If the FM signal is limited only once by a limiter, there occurs shortage of the FM signal which causes black-and-white reverse phenomenon as shown in Fig. 3-16.

Refer to Fig. 3-17.

High component of the signal which especially causes black-and-white reverse phenomenon is firstly picked up (in other words element of AM variation is eliminated) by H.P. AMP. composed of IC8, and then the picked up signal is limited by the first limiter (c).

At the same time lower component of the signal which also includes important information is picked up by LPF (d) (C51, L13, R50).

Both the elements are mixed by the mixing amplifier IC9 (e) and the mixed FM signal is sent to the second limiter IC10 (f) which is provided to remove amplitude variation entirely. This unit has two limiters in two stages for improving the signal-to-noise ratio and prevent the black-and-white reverse phenomenon.

Such the system is called the Duplex Limiter circuit.

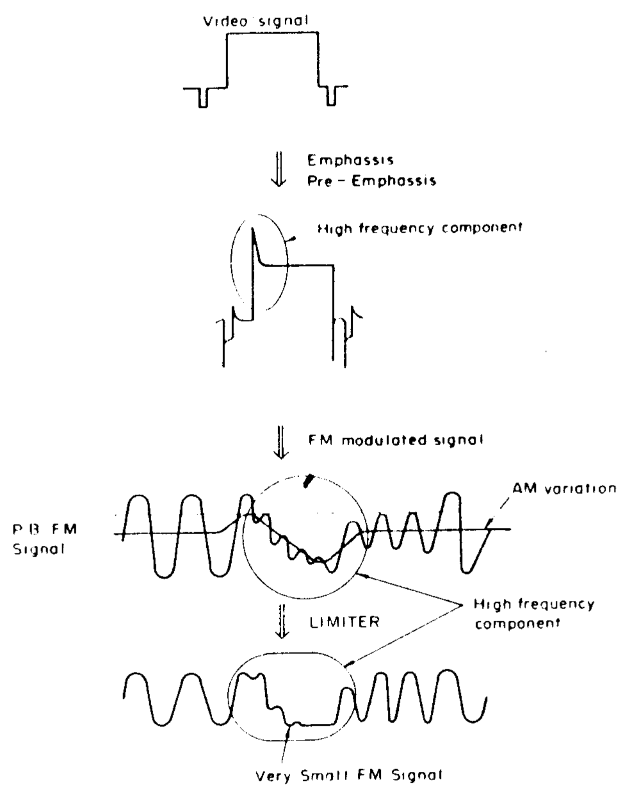


Fig. 3-16 Limiter

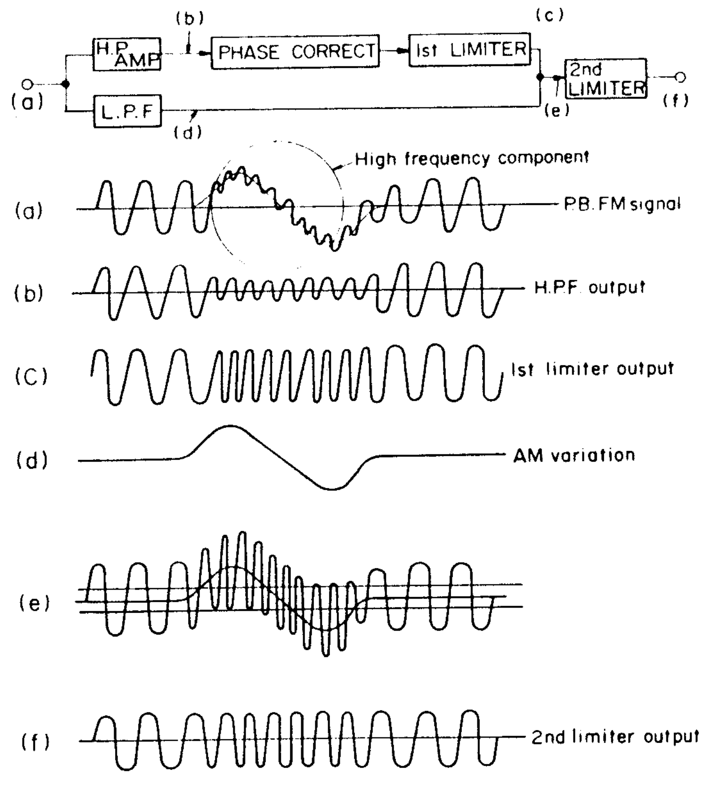


Fig. 3-17 Duplex limiter

3. De-modulator (IC20) (BALANCED MODULATOR)

The demodulation system employed in the VP-7100EG/EK is the delay line type phase detection demodulator consisting of IC10 and delay line DF-1.
All illustrations of the fundamental concept appear in Fig. 3-18, block diagram and corresponding waveforms, respectively.

4. DE-EMPHASIS, SWITCH (IC2), LPF-1, LPF-2, SWITCHER (IC3)

At modulation in recording amplifier, higher frequency component of the video signal is emphasized by the pre-emphasis. De-emphasis is set in order to attenuate the emphasized high component by its characteristic contrary to that of pre-emphasis and to reduce noise in higher band at the same time.
De-emphasized is composed of R99, 100 and C100, 101, 103.
De-emphasized signal is supplied to E.F. and AMP. then supplied to SWITCHER which selects the video signal, record mode signal path or playback mode signal path, then sent to LPF-1 and LPF-2.
After passing through LPF-1 and LPF-2, signal sent to SWITCHER (IC3) which selects the colour mode signal pass (SWITCHER IC2 – LPF-2 – pin 7 of IC3, SWITCHER) or black-and-white mode signal path (SWITCHER, IC2 – LPF-1, pin 8 of IC3 SWITCHER).
Luminance signal which passed through LPF-1 or LPF-2 is supplied to IC5 after its level is determined by R37 (P.B. LEVEL).

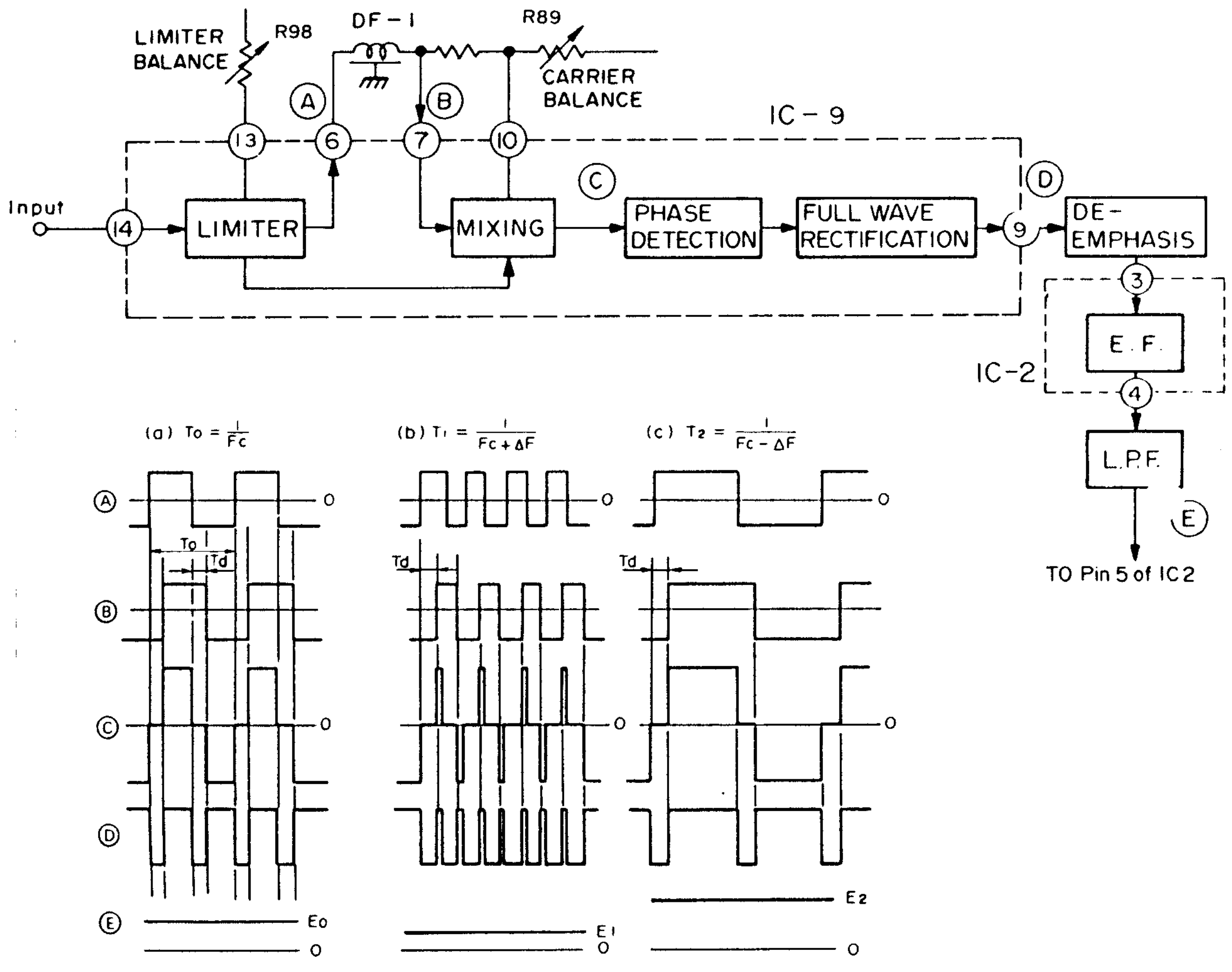

LIMITER BALANCE
R98
DF - 1
R89
CARRIER BALANCE
IC - 9
Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ
13
6
7
10
14
9
Input
LIMITER
MIXING
PHASE DETECTION
FULL WAVE RECTIFICATION
DE-EMPHASIS
3
E. F.
4
IC-2
L.P.F.
TO Pin 5 of IC2
(a) $T_0 = \frac{1}{F_c}$
(b) $T_1 = \frac{1}{F_c + \Delta F}$
(c) $T_2 = \frac{1}{F_c - \Delta F}$
To
Td
0
Eo
E1
E2

Fig. 3-18 Demodulator block diagram and waveforms

5. NOISE SUPPRESSOR CIRCUIT – IC5

The playback luminance signal is supplied to pin 18 of IC5 and fed to pin 1 of IC5 through E.F. (Emitter Follower). This output signal devided into two signals, one whose high frequency component is attenuated by LPF (R60, C69) will be supplied to pin 2 of IC5. After passing through the high-pass amplifier (H.P. AMP), the high-frequency component appears at pin 3 of IC5. The other output is supplied to pin 16 of IC5. Also, in record mode, the electronic-to-electronic (E-E) signal is supplied to pin 16 of IC5. Output from pin 3 of IC5 is supplied to the emitter follower (E.F.) X6 and sents to D6–D9 to pick up its higher element than ±0.3V. R54 (Aperture) is set for adjusting the level of the higher element, and the adjusted element will be supplied to pin 13 of IC5.
The mixing amplifier mixes three signals, namely, one is the luminance signal from pin 16 of IC5, the second is playback colour signal from pin 15 of IC5 and the rest is the higher element of the luminance signal coming from pin 13 of IC5.
The mixed signal is picked up at pin 11 of IC5 and sent to pin 10 of IC2 through C61, then the video signal is supplied through the CLAMP, SQUELCH, OUTPUT.

6. SQUELCH – IC6 (8V301)

Refer to Fig. 3-19.
The circuit is designed to cut-off the video signal. When the pin 6 of IC5 is charged with voltage coming from connector 24, so that Tr2 of IC6 is turned on and pin 8 of IC6 supplies low potential to pin 6 of IC5 SQUELCH, so that the SQUELCH will be released and video signal will be supplied to the OUTPUT.
In playback, when the loading arm reached to the end of loading, AL (After Loading) 12 volts power supply is supplied to pin 2 of IC6 through D1 of IC6 under the time constant of R2 of IC6 and C75, Tr2 turns on and SQUELCH is released.
In the still mode, the STILL 12 volts power supply is supplied to pin 4 of IC6, so that the Tr1 of IC6 turned on and collector voltage is held ground potential.
Consequently, REC (Record) 9 volts does not be supplied to pin 6 of IC6. As a result Tr2 turns off and the SQUELCH will be functioning so the video signal is not supplied to the OUTPUT.

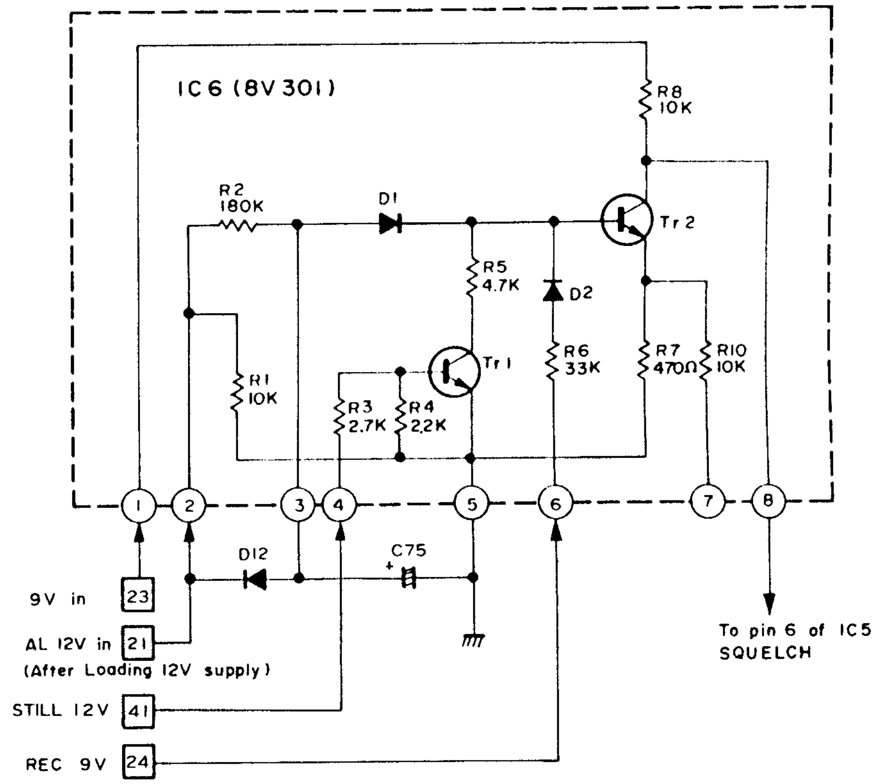

IC6 (8V301)
R8 10K
R2 180K
D1
Tr2
R5 4.7K
D2
R1 10K
Tr1
R6 33K
R7 470Ω
R10 10K
R3 2.7K
R4 2.2K
1
2
3
4
5
6
7
8
D12
C75
9V in
23
AL 12V in
21
(After Loading 12V supply)
STILL 12V
41
REC 9V
24
To pin 6 of IC5 SQUELCH

Fig. 3-19 Squelch

1-1 SPECIFICATIONS

POWER SOURCE	110/127/220/240 V ~, 50 Hz
RATED OUTPUT VOLTAGE	12V DC
RATED OUTPUT CURRENT	2.3A
CHARGING METER	Provided
DIMENSIONS	12.8 cm (W) x 13.8 cm (H) x 32.9 cm (D) (5-1/8" x 5-1/2" x 12-15/16")
WEIGHT	3.4 kg (7.5 lb.)
ACCESSORY PROVIDED	AC power cord

Design and specifications subject to change without notice.

POWER SYSTEM

Connection to the mains supply

The operating voltage of this AC power adapter is preset to 220V or 240V ~ at the factory.
Before connecting to mains, check that the voltage selector on the rear panel is set to the same voltage as your local mains supply.

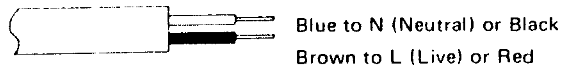
Adapting to local power line

The AC power adapter operates on either 110, 127, 220 or 240V ~. The voltage selector can be reset as follows. Turn the fuse holder and remove the holder. Pull out the voltage selector plug and reinsert it so that the proper voltage appears at the cutout.

IMPORTANT (In the United Kingdom) Mains Supply (AC 240V ~, 50 Hz only)

IMPORTANT

Do not make any connection to the Large Terminal coded E or Green. The wires in the mains lead are coloured in accordance with following code:



If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black. Brown wire to terminal coded L (Live) or coloured Red.

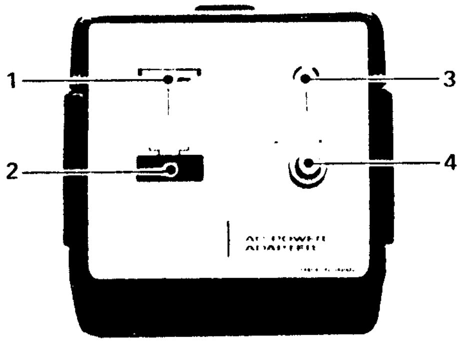
If in doubt consult a competent electrician.

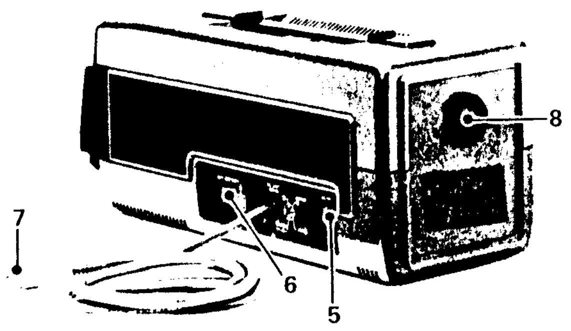
NOTE: We recommend that you should disconnect the AC cord from the outlet.

1-2 PRECAUTIONS

- The VA-7100EG/EK is exclusively used with AKAI VP-7100EG/EK portable video cassette recorder and cannot be employed for other video recorders.
- Be careful not to block the ventilation openings. Heat is generated inside the unit.
- Do not allow inflammables, water or metallic objects to enter the unit, as this will cause damage or malfunctioning.

1-3 CONNECTORS AND CONTROLS

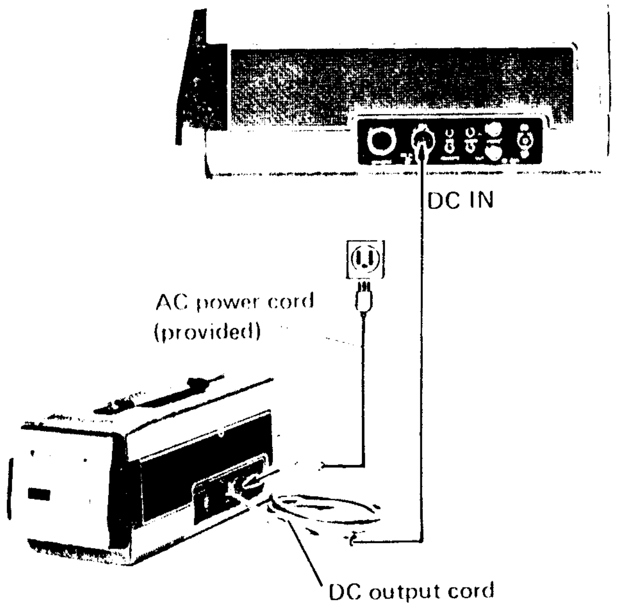




1. **Charging meter**
   Indicates the charge condition of the BP-L30 battery pack when used externally or while inside the recorder, depending on the position of the METER SELECT switch.
2. **Pilot lamp (REC - CHARGE, GREEN - OPERATE)**
   Lights red while charging battery.
   Lights green while providing DC power for the AKAI VP-7100EG/EK from an AC outlet.
3. **METER SELECT switch**
   Set to the VCR BATTERY position when checking the meter for the condition of the battery pack inside the recorder.
   Set to the EXT BATTERY position when checking the condition of the external battery pack.
4. **POWER switch**
   Depress to turn the power ON. Press to turn power OFF.
5. **AC IN jack**
   Connect the provided power cord to this jack.
6. **EXT BATTERY socket**
   For connection to the battery for recharging.
7. **DC output cord**
   Connect to the recorder's DC IN connector to provide power for the recorder or to recharge the BP-L30 battery pack inside the recorder.
8. **Fuse holder/voltage selector**
   Set to the power supply voltage in your area. (See "POWER SYSTEM".)

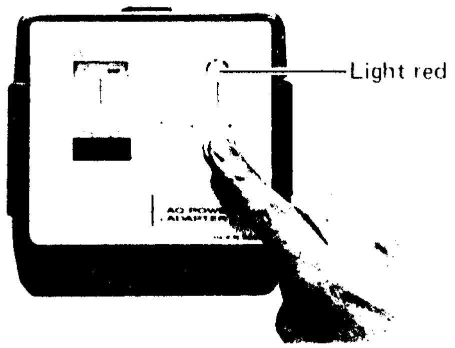
1-4 PROVIDING POWER FOR THE VP-7100EG/EK PORTABLE VIDEO CASSETTE RECORDER

1. Using the provided AC power cord, connect the AC IN jack of this unit to a household AC outlet.
2. Connect the DC output cord of this unit to the recorder's DC IN connector.

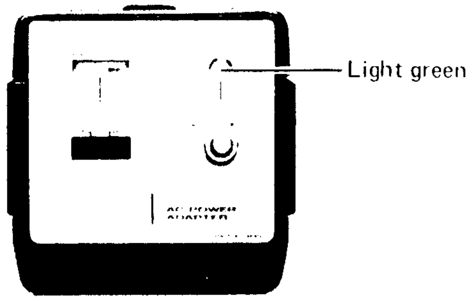


3. Depress the POWER switch to turn power on. Then, pilot lamp lights red.

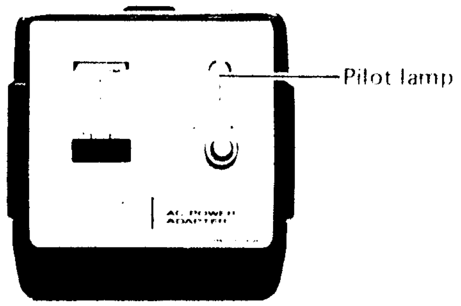
   When turning off the power, be sure to set the recorder in the Stop mode first.



4. Operate the recorder and the pilot lamp lights green.



Pilot Lamp Indication

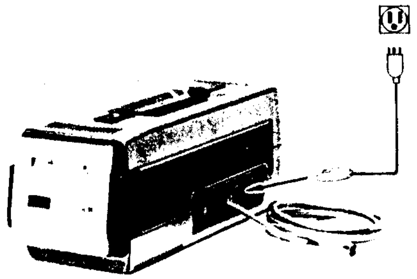


Red	when the recorder is in the Stop mode or when recharging the batteries. When the recorder is in the Stop mode, both the battery inside the recorder and the external battery are automatically being recharged.
Green	when the recorder is being operated. Recording, Playback, Fast Forward and Rewind modes. The batteries are not being recharged while the recorder is in operation.

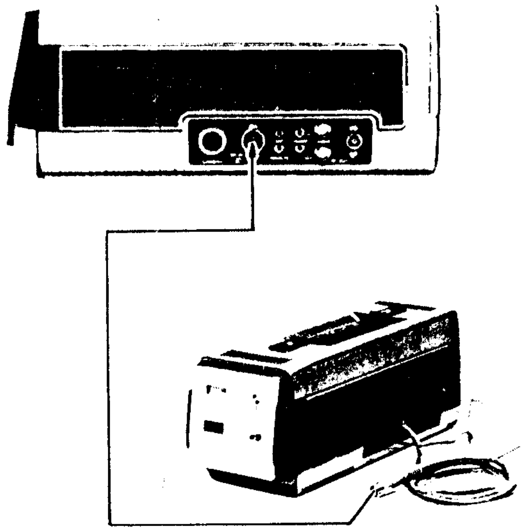
1-5 RECHARGING THE BP-L30 BATTERY PACK SEPARATELY

The VA-7100EG/EK can be used to recharge an external BP-L30 battery pack and the battery pack inside the recorder at the same time.

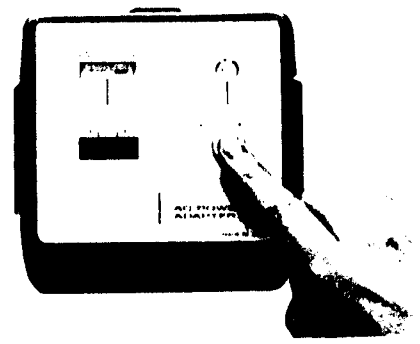
1. Using the provided AC power cord, connect the AC IN jack of this unit to a household AC outlet.



2. Connect the BP-L30 battery pack to the EXT BATTERY socket of this unit.
3. Connect the DC output cord of this unit to the recorder's DC IN 12V connector when recharging an external battery pack and the one inside the recorder at the same time.
   (Be sure to set the recorder in the Stop mode.)



4. Depress the POWER switch to turn it on. The pilot lamp lights red.
   (If the pilot lamp lights green, set the recorder in the Stop mode. Otherwise recharging cannot be performed.)
5. Set the METER SELECT switch to the VCR BATTERY or EXT BATTERY to check the battery charging condition of either.
   (Refer to the section "READING THE CHARGING METER".)



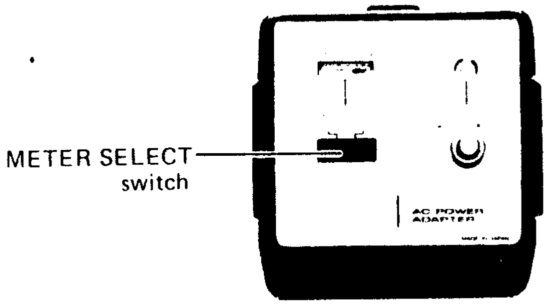
CAUTION!

- Be sure not to carry or move this unit with the external BP-L30 battery pack connected to the EXT BATTERY socket. Do not pull the BP-L30 battery pack cord as it may be dangerous.

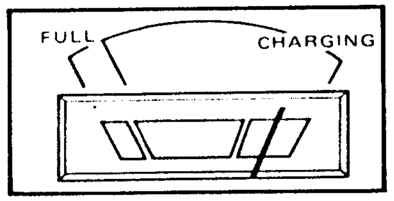
1-6 READING THE CHARGING METER

It is possible to check the battery charging condition of either battery pack by using the METER SELECT switch.

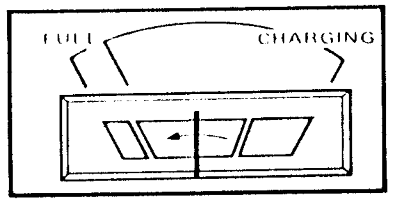
1. Set the METER SELECT switch according to the battery to be checked.
   VCR BATTERY . . . . . . to check the BP-L30 inside the recorder.
   EXT BATTERY . . . . . to check the external BP-L30 connected to the EXT BATTERY socket of this unit.



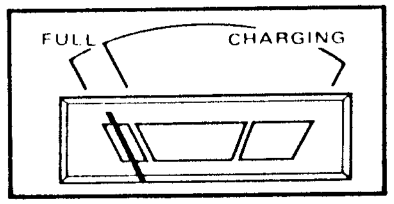
2. When charging starts, the needle deflects to the right.



3. As charging proceeds, the needle gradually moves toward the "FULL" position.



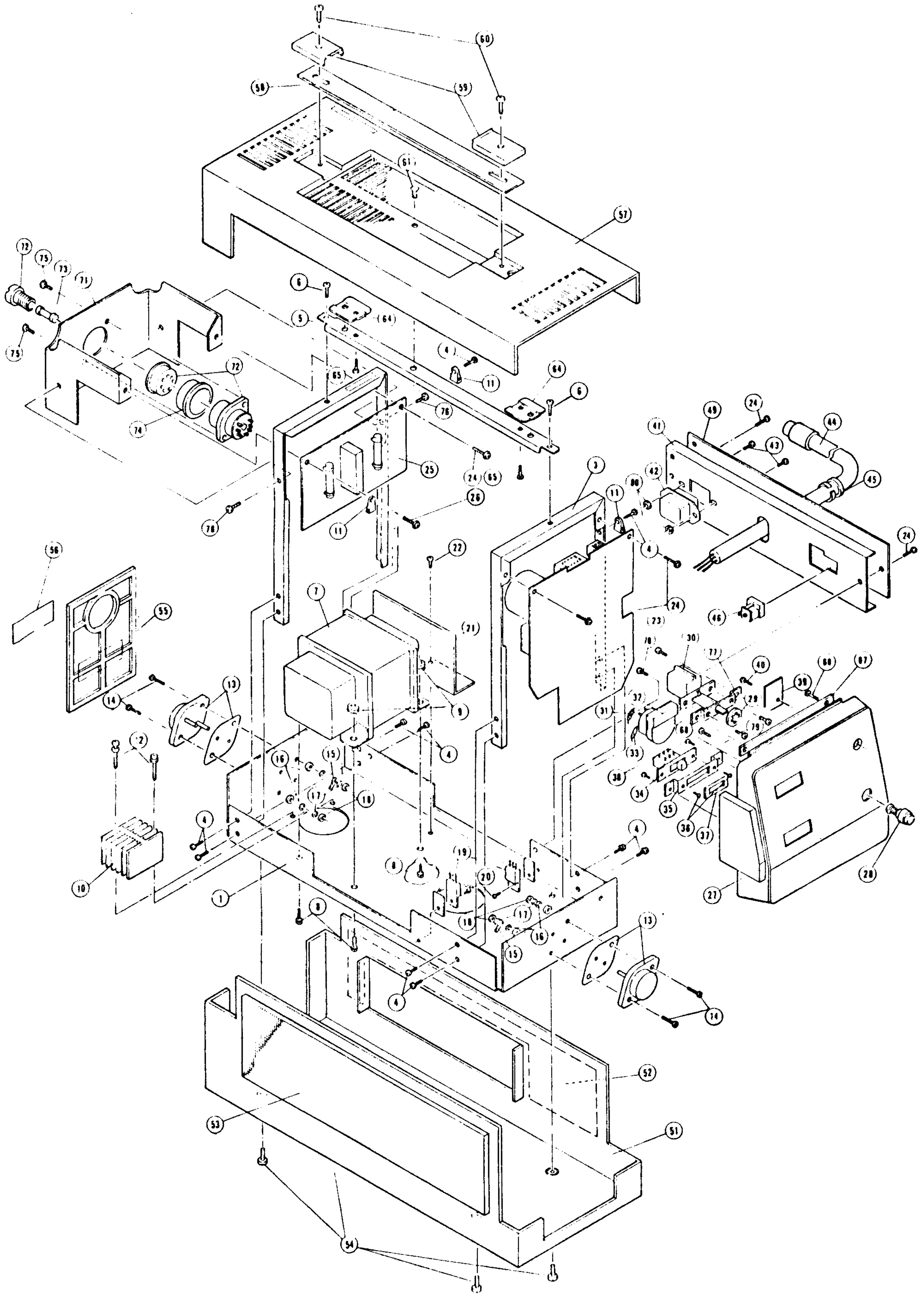
4. The battery pack is fully charged when the needle indicates FULL.



CAUTION!

- A discharged battery pack will need up to approx. 8 hours to recharge.
- Always recharge the BP-L30 Battery Pack immediately after use, regardless of how much of the power has been used. Store the battery pack 100% charged. If it is left discharged after use, it will continue to discharge, shortening its life or sometimes making it unusable.
- Be sure to recharge the battery pack when using it after storage of longer periods of time.

1-7 EXPLODED VIEW



1. EXPLODED VIEW

Ref. No.	Parts No.	Description	Schematic No.
1-7	BT702838	Power Trans VA-7100	PU31672 BS
1-10	ED702839	Diode M4B 51-11 VA-7100 (D101)	M4B 51 11
1-13	ET702840	Transistor 2SC1030C VA-7100 (X101, 102)	2SC1030C
1-19	ET702841	Transistor 2SD389D VA-7100 (X103, 104)	2SD389Q
1-27	BD702842	Front Cover Assy VA-7100EG	PU32059G
1-27	BD702843	Front Cover Assy VA-7100EK	PU32059H
1-28	SB702844	Button Assy VA-7100	PU20803 B
1-30	ES702845	Push SW. VA-7100	QSP2111 011 BS
1-32	EM702846	Meter VA-7100	PU30899
1-34	ES702847	Slide SW. VA-7100	QSS2228 101
1-37	SE702848	SW. Cover VA-7100	PU46456
1-42	EJ702849	AC Connector VA-7100	QMC9017 001 BS
1-43	ZS702850	Screw VA-7100	SDBP3008BS
1-44	EW702851	DC Cord Assy VA-7100	PU31544B
1-45	EZ702852	Cord Stopper VA-7100	QHS6374 162
1-46	EJ702853	Jack Assy VA 7100	QMA1221 001
1-49	SP702854	Connector Panel VA-7100	PU31955
1-51	SP702855	Bottom Plate VA-7100	PU10130 9
1-52	VT702856	Side Sheet (R) VA-7100	PU31581
1-53	VT702857	Side Sheet (L) VA-7100	PU31554
1-54	ZS702858	Screw VA-7100	SDSP3008NS
1-55	SP702859	Rear Cover	PU31954 4
1-57	BC702860	Top Cover VA-7100	PU10131 9
1-58	VT702861	Handle VA-7100	PU46361
1-59	VT702862	Handle Cover VA-7100	PU46385 2
1-60	ZS702863	Screw VA-7100	SHBP4016BS
1-61	ZS702864	Screw VA-7100	SSSP3006NS
1-72	EJ702865	Volt Selector VA-7100	PU45383 2 BS
1-73	EF702866	Fuse VA-7100	QMF51A2 2R0 BS
1-74	EZ702867	Cover VA-7100	C40621
1-75	ZS741547	Screw VS-9500	LPSP3010ZS

3-2-6 Colour signal playback system – Main path

Fig. 3-20 shows the block diagram of the main path of the colour signal playback system.

The playback colour signal from Preamplifier circuit board is supplied through IC201 (Amplifier) and E.F. to ACC (Automatic Colour Control). After passing through the ACC circuit, the colour signal is controlled to a constant level. Then the colour signal is supplied to the BALANCED MODULATOR which converts with the 5.06 MHz signal coming from Band-Pass-Filter (BPF-203). The signal from the BALANCED MODULATOR is fed to the band-pass filter (BPF-202), so that only the 4.43 MHz ± 500 kHz colour signal is sent to the emitter follower X204 (E.F.). Then the colour signal is supplied to X206 (AMP).

After passing through the emitter follower X204 (E.F.) the signal is supplied to DL202 (Delay Line) which eliminates cross-talk element of the signal component and improves its S/N ratio. After that, the signal is amplified by IC203 (Amplifier) and then supplied to the killer amplifier.

After passing through the killer amplifier the colour signal is sent to IC5, then it is mixed with luminance signal to be the video out signal.

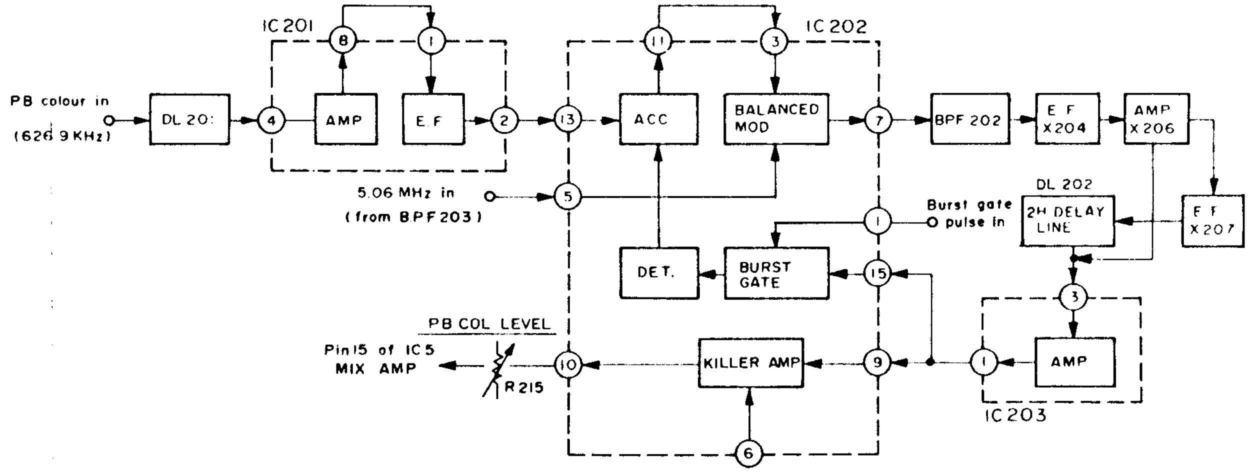
1. ACC – IC202 (AN305)

Playback colour signal from IC201 (Emitter Follower) is sent to pin 13 of IC202 Automatic Colour Control (ACC). ACC control system is as follows.

The colour signal amplified by IC203 is fed to pin 15 of IC202 GATE, and the burst separator pulse is supplied to pin 1 of IC202, so the burst signal which is separated from a colour signal is sent to ACC detector.

The ACC detector detects the burst level into DC potential, this DC voltage change is supplied to ACC circuit as a control voltage.

The ACC circuit in playback is in operation by detecting the peak value of the burst level of the playback signal. The colour signal which was controlled to have constant burst level by the ACC circuit is converted in its frequency by the main converter. As a result, both sum and difference frequencies will appear. The difference element (4.43 MHz ± 500 kHz) of colour signal is picked up by BPF-202.


IC201
IC202
PB colour in
(626.9 KHz)
DL 201
AMP
E F
ACC
BALANCED MOD
BPF 202
E F X204
AMP X206
5.06 MHz in (from BPF203)
Burst gate pulse in
DL 202
2H DELAY LINE
E F X207
DET.
BURST GATE
PB COL LEVEL
Pin15 of IC5 MIX AMP
R215
KILLER AMP
AMP
IC203
8
1
4
2
13
11
3
7
5
15
10
9
6

KEY TO ABBREVIATIONS:

ACC : Automatic Colour Control
BPF : Band Pass Filter
D.L. : Delay Line
E.F. : Emitter Follower
SW : Electronic Switch
2H : two Horizontal Scanning Lines

Fig. 3-20 Colour signal playback system (Main path)

2. 2-H DELAY LINE FILTER (DL202)

Refer to subsection 1-7-6 and 1-7-7.

Its function is to pass only 4.43 MHz (+ 500 kHz) colour signal. The circuit is composed of 2-H delay line and straight line as shown in Fig. 3-21 (C).

In the VHS colour recording system, the following is shown in recording.

CH-1 track: Colour phase is recorded with normal phase.
CH-2 track: Colour phase is recorded with delaying 90° every 1-H.

Fig. 3-21 (A) shows video recording pattern.
Fig. 3-21 (B) shows colour recording phase.
Fig. 3-21 (C) shows playback colour phase.

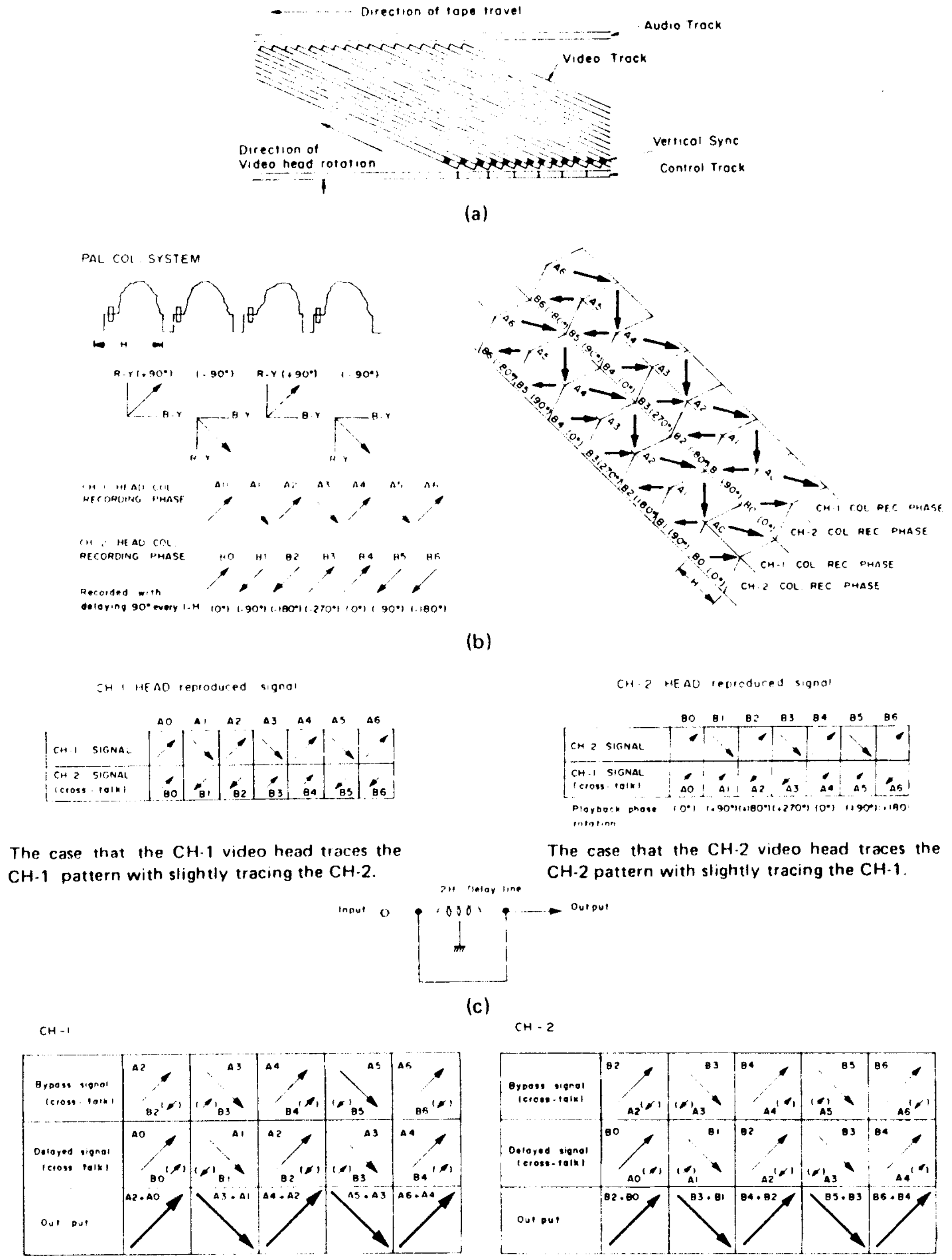

Direction of tape travel
Audio Track
Video Track
Direction of Video head rotation
Vertical Sync Control Track
(a)
PAL COL SYSTEM
R-Y (+90°)
(-90°)
B-Y
CH-1 HEAD COL RECORDING PHASE
CH-2 HEAD COL RECORDING PHASE
Recorded with delaying 90° every 1-H
CH-1 COL REC PHASE
CH-2 COL REC PHASE
(b)
CH-1 HEAD reproduced signal
CH-1 SIGNAL
CH-2 SIGNAL (cross-talk)
CH-2 HEAD reproduced signal
CH-2 SIGNAL
CH-1 SIGNAL (cross-talk)
Playback phase rotation
The case that the CH-1 video head traces the CH-1 pattern with slightly tracing the CH-2.
The case that the CH-2 video head traces the CH-2 pattern with slightly tracing the CH-1.
2H delay line
Input
Output
(c)
CH-1
CH-2
Bypass signal (cross-talk)
Delayed signal (cross-talk)
Out put
(d)

Fig. 3-21

The phase of the main signal for CH-1 is shown as in the figure, while the phase of cross-talk signal for CH-2 turns 90° every 1-H.

The signal is supplied to 2-H delay line filter. The main signal (CH-1) becomes a complex vector and the cross-talk signal is cancelled as shown in Fig. 3-21 (D). In other words, cross-talk signal is eliminated by the 2-H delay filter.

3. COLOUR KILLER AMPLIFIER (KILLER AMP) – IC202 (AN305)

The colour signal whose cross-talk element has been eliminated by the 2-H delay filter is supplied to the colour killer amplifier (IC202).

Refer to Fig. 3-22.

The colour killer amplifier is controlled by DC potential coming through pin 6 of IC202 being supplied by the killer detector IC205 (KILLER DETECTOR). When the pin 6 of IC202 is charged with high voltage (8V DC, approx.) which is colour mode, the killer does not work and the colour signal passes through the killer amplifier and is supplied to pin 10 of IC202. In case of B/W signal, pin 6 of IC202 is charged with low voltage (0V DC, approx.) and the killer is in operation, so no colour signal (actually that is, black-and-white signal leakage or noise components) appears at the pin 10 of IC202.

The colour signal passing through the colour killer amplifier is supplied to IC5 (AN303) which mixes it with luminance signal to make it the final video output signal.

The above is a description on the main signal of the colour signal playback system, and the following is described on APC system of colour signal playback.

3-2-7 Colour signal playback system – automatic phase control (APC) system

Refer to Fig. 3-23.

In recording mode, the automatic phase control (APC) system is not operating and the VXO (Variable Crystal Oscillator) works as a fixed oscillator to oscillate 4.43 MHz signal which is supplied to the BALANCED MODULATOR (IC208). On the other hand, the BALANCED MODULATOR is supplied with a 625 kHz signal from the AFC system to convert its frequency, and the converted signal is sent to BPF-203 which picks up the sum element of the signal (5.06 MHz) to supply it to the BALANCED MODULATOR (IC202).

In the playback mode, the automatic colour control (ACC) supplies 626.9 kHz ± Δf signal which includes such fluctual elements as jitter to the BALANCED MODULATOR (IC202). At the first stage the automatic phase control (APC) loop is not in operation yet and the variable crystal oscillator (VXO) oscillates 4.43 MHz signal. This 4.43 MHz signal and the 625 kHz ± Δf signal from AFC are both fed into the BALANCED MODULATOR (IC208). As a result, both sum and difference frequencies will be seen in the output. Then this output signal through the band-pass filter (BPF-203), so the only sum component (5.06 MHz ± Δf) is supplied to the BALANCED MODULATOR (IC202), and the 4.43 MHz (difference frequency component) can be taken out by the band-pass filter (BPF-202).

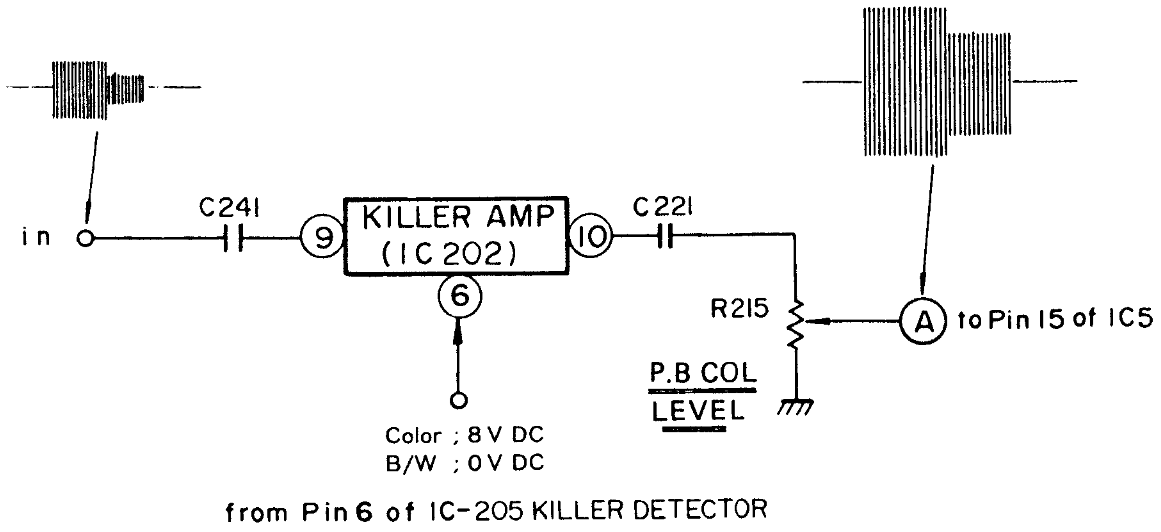
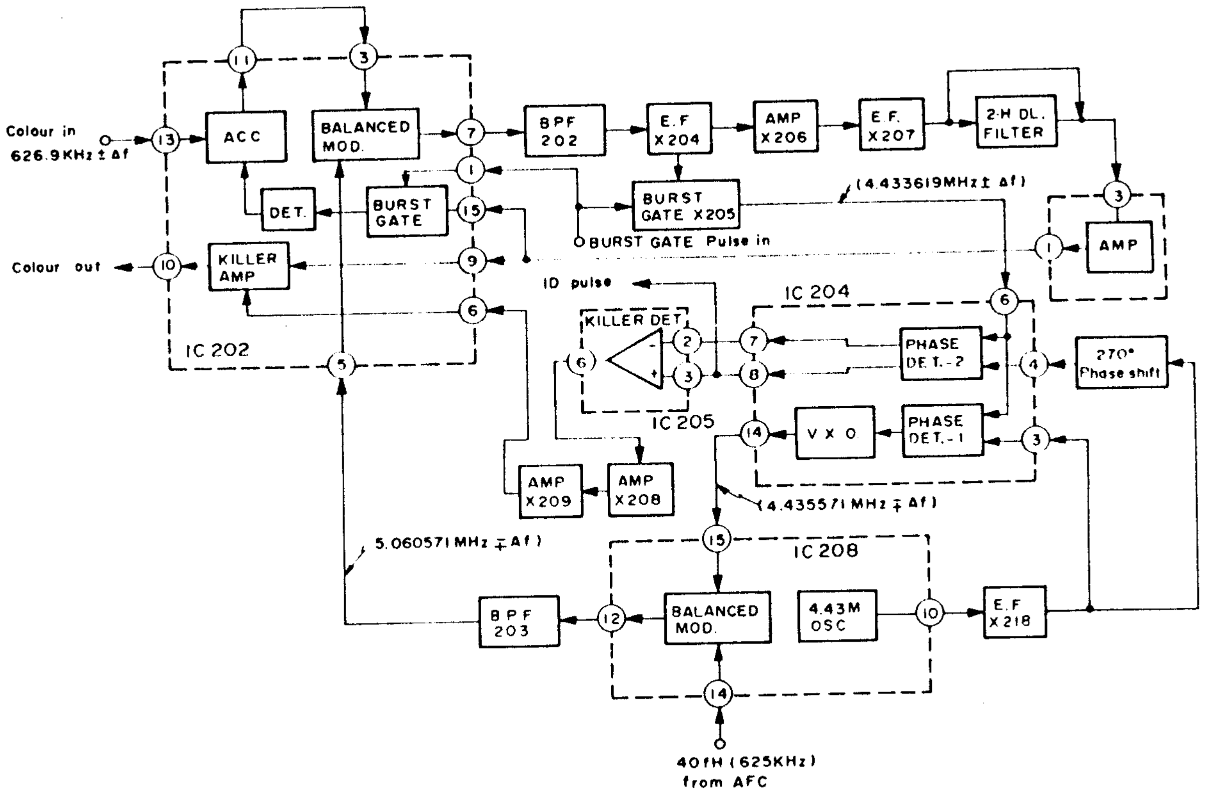


Fig. 3-22 Colour killer amplifier



KEY TO ABBREVIATIONS:
BPF : Band Pass Filter
CONV. : Converter
D.L. FILTER: Delay Line Filter
E.F. : Emitter Follower
V.X.O. : Variable X'tal Oscillator

Fig. 3-23 Block diagram of automatic phase control (APC) system

On the other hand, the picked up 4.43 MHz ± Δf signal is supplied to the burst gate of X205, which picks up only burst signal of the colour signal and supplies it to the phase detector-1 and -2 (PHASE DET-1 and -2).

The 4.43 MHz signal from the crystal oscillator, IC208 and 4.43 MHz ± Δf signal from the burst gate are supplied to the phase detector-1 (PHASE DET-1) which compares the phase of two signals and sends the error voltage to the variable crystal oscillator (VXO). Consequently, 4.43 MHz ± Δf signal comes out of the variable crystal oscillator to be supplied to BALANCED MODULATOR (IC208) and the band-pass filter (BPF-203) from which 5.06 MHz ± Δf signal is supplied to BALANCED MODULATOR (IC202).

After passing through APC system, the colour signal is obtained as the correct and stable 4.43 MHz (±500 kHz) output at the band-pass filter (BPF-202) output.

$$(5.06 \text{ MHz} \pm \Delta f) - (625 \text{ kHz} \pm \Delta f) = 4.43 \text{ MHz}$$

Both the burst signal from the burst gate X205 and continuous 4.43 MHz waveform from the IC208 are supplied to the phase detector-2 (PHASE DET-2). These two signals are compared in phase each other at the phase detector-2 (PHASE DET-2), and, if there is normal phase shift between them, a plus voltage is generated at the output.

The voltage is supplied to the killer detector (KILLER DET.) IC205 and high voltage output sends to the killer amplifier IC202 (Killer Amp.), so the colour signal (4.43 MHz ± 500 kHz) passes through to IC5 as the playback colour signal. On the other hand, if there is a difference of 180° phase-shift between the two signals at the phase detector-2, negative pulse is supplied to automatic frequency control (AFC) through the X217. This pulse is called ID Pulse (Identification Pulse).

As described above, APC functions in three ways, nemely,

- o Phase control of colour signal,
- o Colour killer function by phase detection,
- o AFC control with ID pulse.
  (Refer to Section 3-2-8 for details.)

1. CRYSTAL OSCILLATOR – IC208

This circuit operates only in playback, then it oscillates 4.433619 MHz signal correctly. This signal is supplied to the phase detector-1 and -2 (PHASE DET-1 and -2).

2. BURST GATE – X205

Refer to Fig. 3-24.
The playback colour signal is supplied to a gate of X205 through C231 and the burst gate pulse is supplied to the other gate of X205 through R230.
Accordingly, X205 is on (amplifying) only in receiving the burst gate pulse and burst signal appears at the drain. Components L203, C233 and R231 compose the 4.43 MHz resonance circuit, and D203 and D204 work as the limiter.
This burst signal is supplied to the phase detector.

3. PHASE DETECTOR-1, -2 – IC204

The 4.43 MHz signal from the crystal oscillator and playback burst signal are supplied to the phase detector-1 (PHASE DET-1), and detects the phase shift between the signals. Refer to Fig. 3-25.
The phase detector-1 (PHASE DET-1) monitors the phase relationship between the 4.43 MHz signal from the crystal oscillator and the burst signal from the playback colour signal and converts any phase shift into a voltage change. This voltage change is then fed to the variable crystal oscillator (VXO). To illustrate the operation of the phase detector-1 (PHASE DET-1), we will assign the following definitions.
The 4.43 MHz ± Δf signal from the burst gate is = f_2
The 4.43 MHz reference signal from the crystal oscillator is = f_1

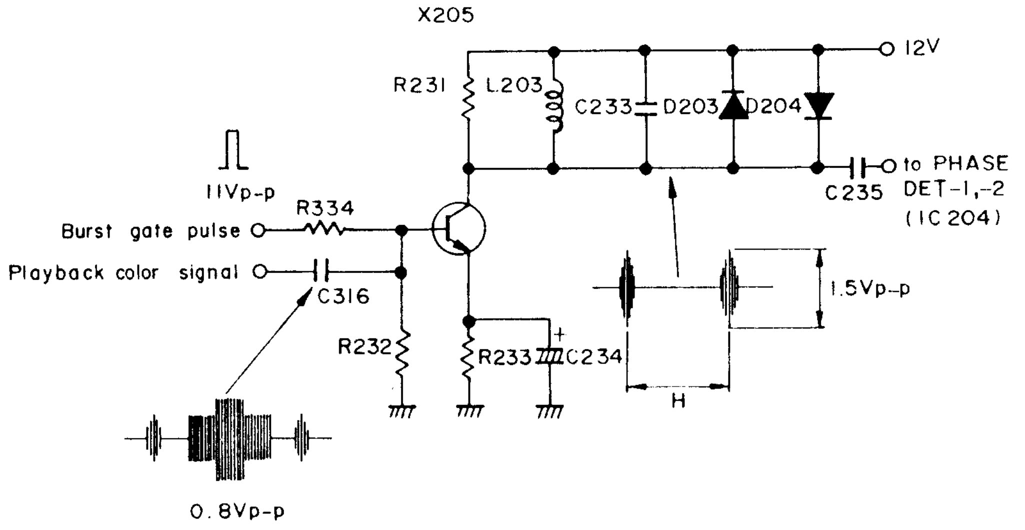

X205
12V
R231
L203
C233
D203
D204
11Vp-p
R334
Burst gate pulse
Playback color signal
C316
to PHASE DET-1,-2 (IC 204)
C235
1.5Vp-p
R232
R233
C234
H
0.8Vp-p

Fig. 3-24 Burst gate

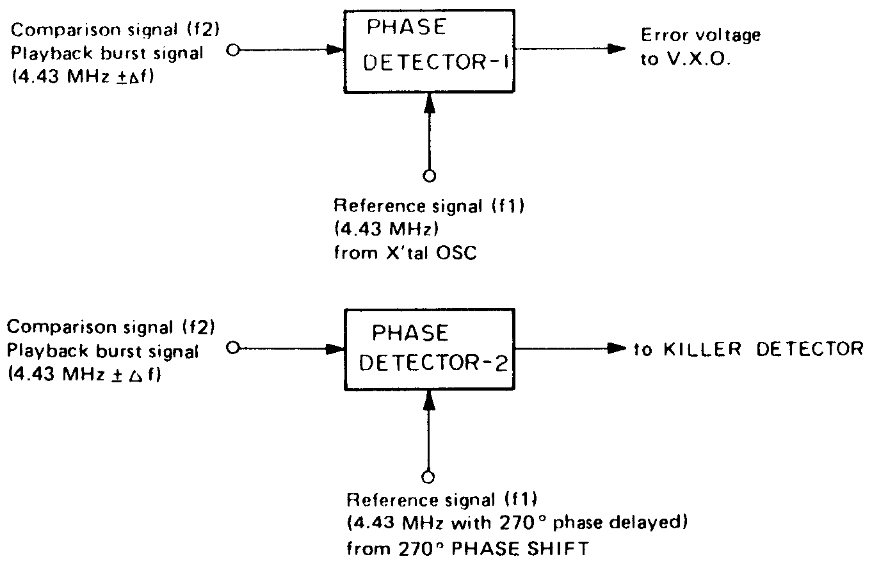

Comparison signal (f2)
Playback burst signal
(4.43 MHz ±Δf)
PHASE DETECTOR-1
Error voltage to V.X.O.
Reference signal (f1)
(4.43 MHz)
from X'tal OSC
Comparison signal (f2)
Playback burst signal
(4.43 MHz ± Δ f)
PHASE DETECTOR-2
to KILLER DETECTOR
Reference signal (f1)
(4.43 MHz with 270° phase delayed)
from 270° PHASE SHIFT

Fig. 3-25 Phase detector

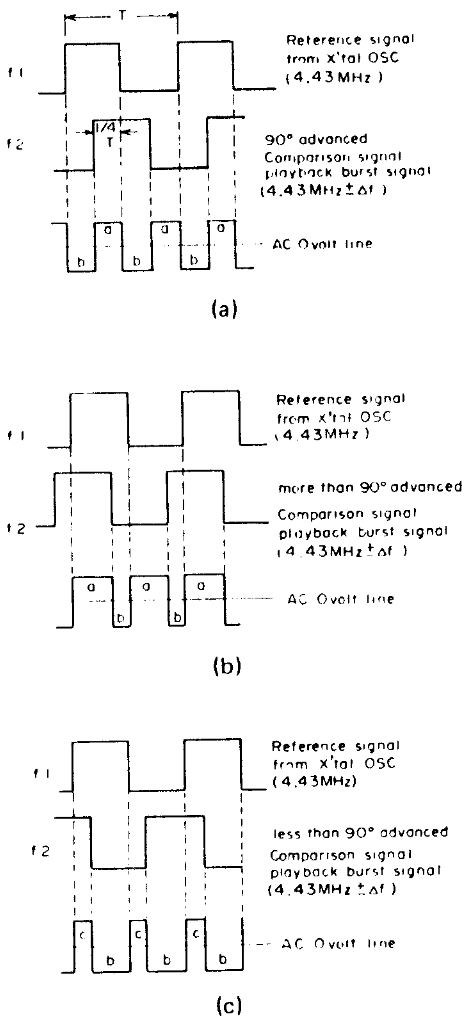

T
f1
Reference signal from X'tal OSC (4.43MHz)
f2
1/4 T
90° advanced
Comparison signal
playback burst signal
(4.43MHz±Δf)
a
b
AC 0volt line
(a)
f1
Reference signal from X'tal OSC (4.43MHz)
f2
more than 90° advanced
Comparison signal
playback burst signal
(4.43MHz±Δf)
a
b
AC 0volt line
(b)
f1
Reference signal from X'tal OSC (4.43MHz)
f2
less than 90° advanced
Comparison signal
playback burst signal
(4.43MHz±Δf)
c
b
AC 0volt line
(c)

Fig. 3-26

Dependent upon the phase relation between these two signals, the following outputs are obtained from the phase detector-1 (PHASE DET-1).
In the case, the phase relation of f_2 (the burst signal from playback colour signal) advanced 90° to that of f_1 (4.43 MHz signal from the crystal oscillator), the output waveform shows the positive area (a) and negative area (b) is equal against the AC 0 volt as shown in the figure. Therefore, reference voltage is supplied to the variable crystal oscillator.
Refer to Fig. 3-26 (b).
In the case, the phase relation of f_2 (the burst sisgnal from the playback signal) advnaced more than 90° to that of f_1 (4.43 MHz signal from the crystal oscillator), the output waveform shows (a) < (b) against the AC 0 volt line as shown in Fig. 3-26(b). Therefore, the positive voltage against the reference voltage is supplied to the variable crystal oscillator.
Refer to Fig. 3-26(c).
In the case, the phase relation of f_2 (the burst signal from the playback signal) advanced less than 90° to that of f_1 (4.43 MHz signal from the crystal oscillator), the output waveform shows (a) > (b) against the AC 0 volt line as shown in Fig. 3-26(c). Therefore, the negative voltage against the reference voltage is supplied to the variable crystal oscillator.
The relation between the output and phase difference of the phase detector-1 is shown below.
Refer to Fig. 3-27.
The phase detector-1 detects phase of the playback colour signal. In the case, if the phase relation of f_2 advanced 90° against the f_1, the output of phase detector-1 is zero (reference voltage). In the range of ± 90° centralizing that point +90°, the output voltage corresponding to phase difference between f_1 and f_2 is obtained.

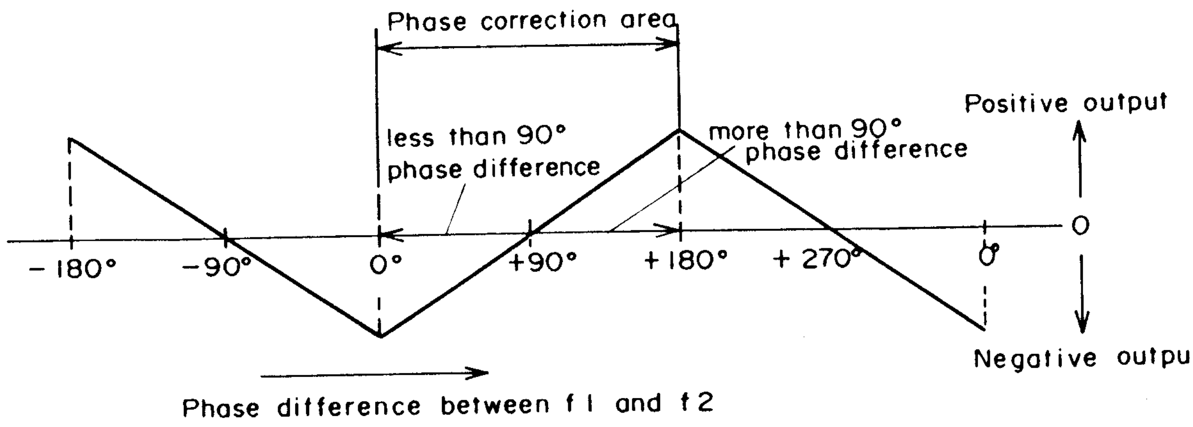


Fig. 3-27 Phase difference between f_1 and f_2

The phase detector-2 detects phase difference between them, and sends output signal to the colour killer circuit. The principle and output are the same as phase detector-1, but the 4.43MHz signal from the crystal oscillator is 270° phase delayed by the 270° PHASE SHIFT.

This signal (270° phase advanced) is sent to the phase detector-2, so the relation between phase difference of f_1 and f_2 is shown in Fig. 3-28.

4. VARIABLE CRYSTAL (X'TAL) OSCILLATOR (VXO) – IC204

In Record mode, the crystal oscillator IC208 is not oscillating and no burst signal is supplied to the phase detector-1, the error voltage from the detector is "zero" (DC potential is nearly half of the power source voltage) which is supplied to VXO, and then it oscillates 4.43 MHz signal correctly. In Play mode, the oscillation frequency of the variable crystal oscillator (VXO) is controlled by the output of phase detector-1 (PHASE DET-1).

In Play mode, in case the phase relation of the 4.43MHz signal from the playback burst signal is advanced 90° to that of the crystal oscillator signal, the output of the phase detector-1 is zero. Receiving this output, the variable crystal oscillator (VXO) oscillates constant 4.43MHz signal correctly.

For example as shown in Fig. 3-29, if the phase relationship of P.B. burst signal is advanced (more than 90° advanced), the phase detector-1 output voltage is increased and this voltage is supplied to the VXO. This DC voltage controls oscillation of the VXO to delay the phase of 4.43 MHz signal.

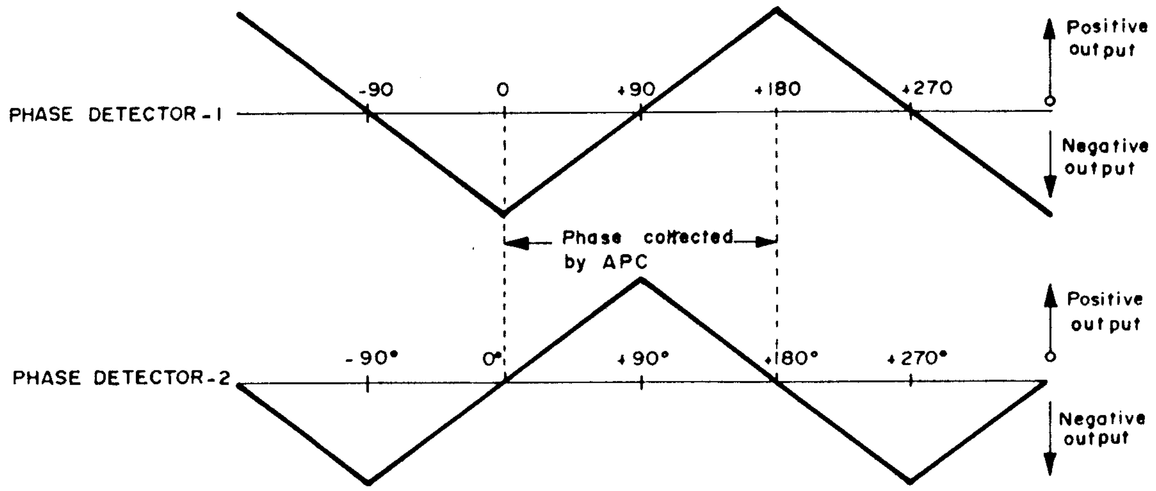


Fig. 3-28

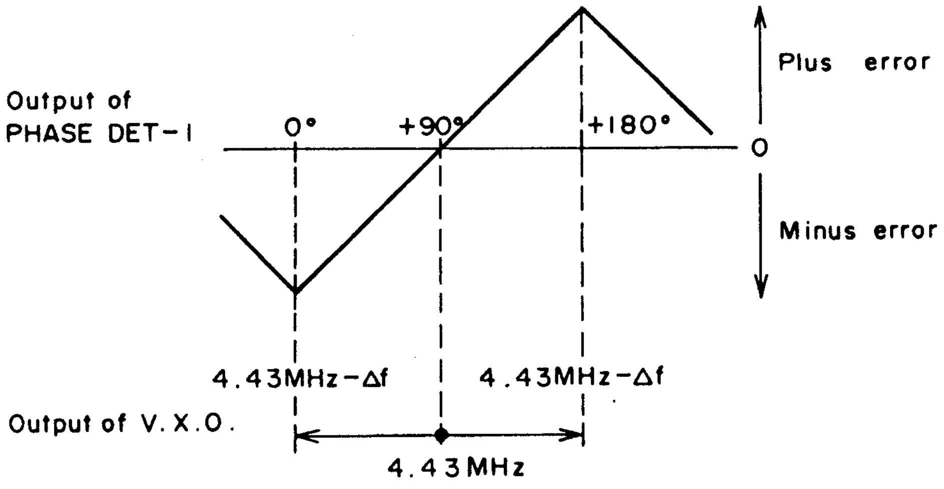


Fig. 3-29 Oscillation of the VXO

The phase detector-1 and the variable crystal oscillator are connected each other inside the IC204.

Refer to Fig. 3-30.

The VXO compensation circuit is set to avoid frequency variation of VXO, which happens in the case that DC potential of the phase detector-1 output drifts with temperature.

The VXO is the differential type whose input is connected with two systems; one, pin 11 of IC204 is connected with C256 and its time constant is large, the other, pin 12 of IC204 is connected with C253, C254 and R252 and its time constant is small. In addition, pin 10 of IC205 is supplied positive horizontal sync signal, which makes switching of the two input signals. Therefore, if there is voltage drift, the circuit works to cancel any potential difference between the two input signals of the variable crystal oscillator (VXO), then the output of the variable crystal oscillator (VXO) will be no frequency change. This signal is supplied to the pin 15 of the BALANCED MODULATOR IC208.

5. KILLER DETECTOR – IC205

The killer detector circuit is controlled by the output signal from the phase detector-2.

Refer to Fig. 3-31, the normal playback colour signal, phase difference at phase detector-2 is within ±90° against centering at 180° and all the output of the phase detector-2 is positive output (DC voltage is positive from the reference value as shown in Fig. 3-28). This positive

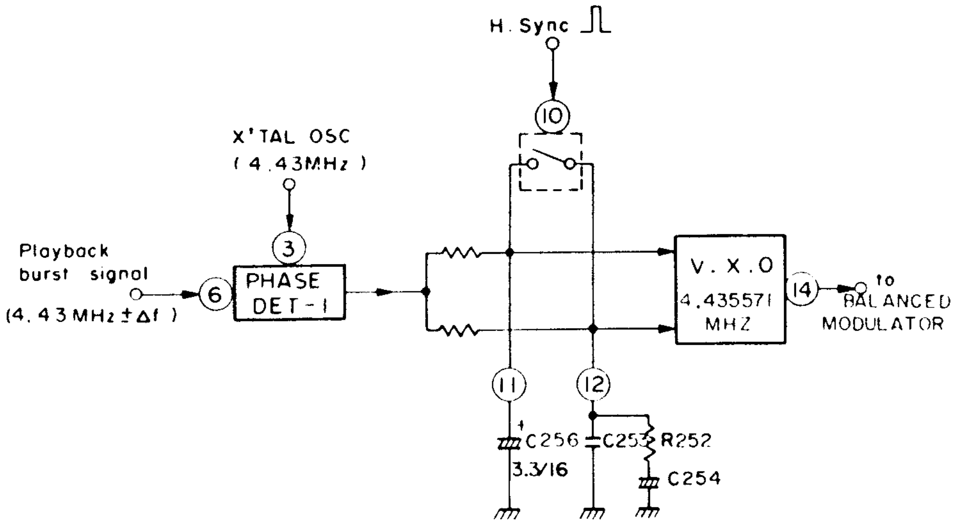


Fig. 3-30 VXO compensation circuit

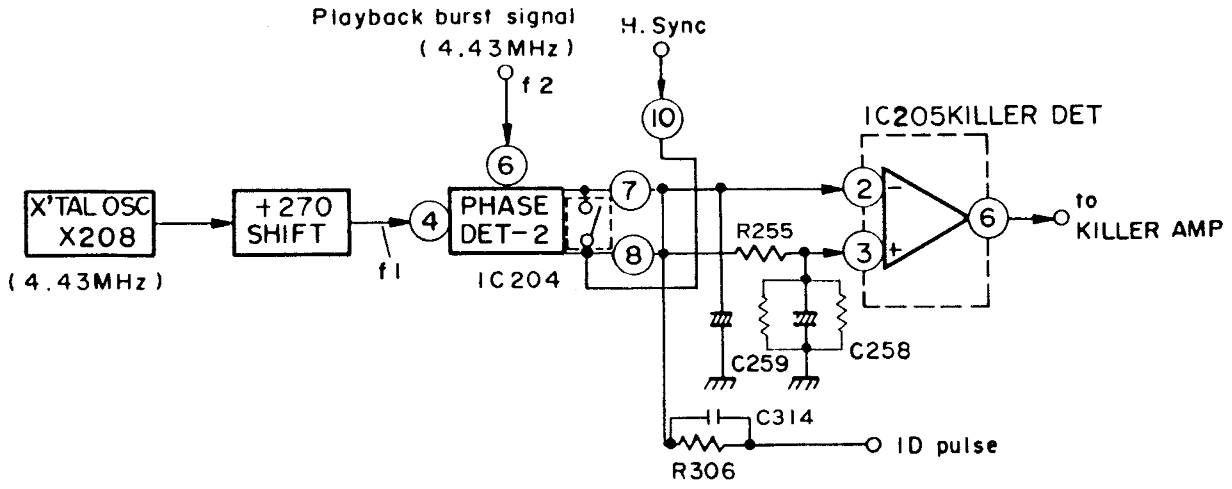


Fig. 3-31 Killer detector

output is picked up through pin 8 of IC204, supplied to "positive input" of the killer detector through R255, then amplified there to be the output of high voltage is supplied to the killer amplifier, the colour signal is able to pass through the killer amplifier.

The output of the phase detector-2 is "zero", and there is no potential difference between two inputs to the killer detector. As a result pin 6 of IC205 is charged with low voltage (2V DC approx.), and the colour killer starts operation to cut colour signals.

As described in the section of the variable crystal oscillator (VXO), by supplying horizontal sync pulse to pin 10 of IC204, potential difference between the two inputs to pin 3 and pin 2 of IC205 is cancelled. Components C259, R256, R338 and C258, all work for correct operation of the killer detector utilizing the difference of each time constant. The following is described on identification pulse (ID pulse) generation. Refer to Fig. 3-27.

In the VHS PAL system, the phase of the CH-2 colour signal is rotated 90° every successive 1-H. If there is a difference between the timing in recording and in playback, the phase difference between f_1 and f_2 is considered to be more than ±90°.

The response range of the phase detector-1 detecting colour phase is between 0° and 180° in principle, (refer to Fig. 3-29), however, in actual there is a possibility to occur larger phase difference. In this case it is impossible to control the phase difference by the automatic phase control (APC) system.

Because of the automatic phase control (APC) system corrects within ±90° phase difference between the 4.43 MHz signal from crystal oscillator and playback burst signal.

Therefore, by utilizing the phase detector-2 which generates ID pulse when the phase difference is more than ±90°, AFC system is controlled by receiving the minus output coming through R306 to base of X217 and the phase turns to normal phase.

This is the function of ID pulse. For details of ID pulse, refer to the section of "AFC".

3-2-8 Automatic frequency control (AFC) system

Refer to Fig. 3-32.

AFC system takes the same action both in recording and playback except the reference signal. In recording the reference signal is the horizontal sync pulse of the input video signal while the horizontal sync pulse of the playback video signal in playback.

The functions of AFC system:

- o to generate 40 x fH (15.625 kHz)
  (40 x 15.625 kHz = 625 kHz)
- o to make the 40 fH signal rotate every 1-H at CH-2.
- o to compensate phase control of the colour signal receiving ID pulse.
- o to make complete compensation without horizontal sync pulse.

The horizontal sync pulse of the reference signal is supplied to pin 10 of IC207 of the monostable multivibrator which forms the signal to square waveform, then it is picked up through pin 14 of IC207.

This output is supplied to pin 7 of IC208 AFC PHASE DETECTOR as a reference horizontal (fH) signal.

On the other hand, 160 fH (2.5 MHz) signal is oscillated by the voltage control oscillator (VCO) (IC208).

This signal is picked up at pin 17 of IC208 and supplied to pin 6 of IC207 (1/4 COUNT DOWN) where the signal is counted down to 1/4 and sent to the 1/10 and 1/4 count down, so that the only fH signal is picked up through the pin 2 of IC207 and supplied to the pin 8 of IC208, AFC PHASE DETECTOR as a comparison fH signal.

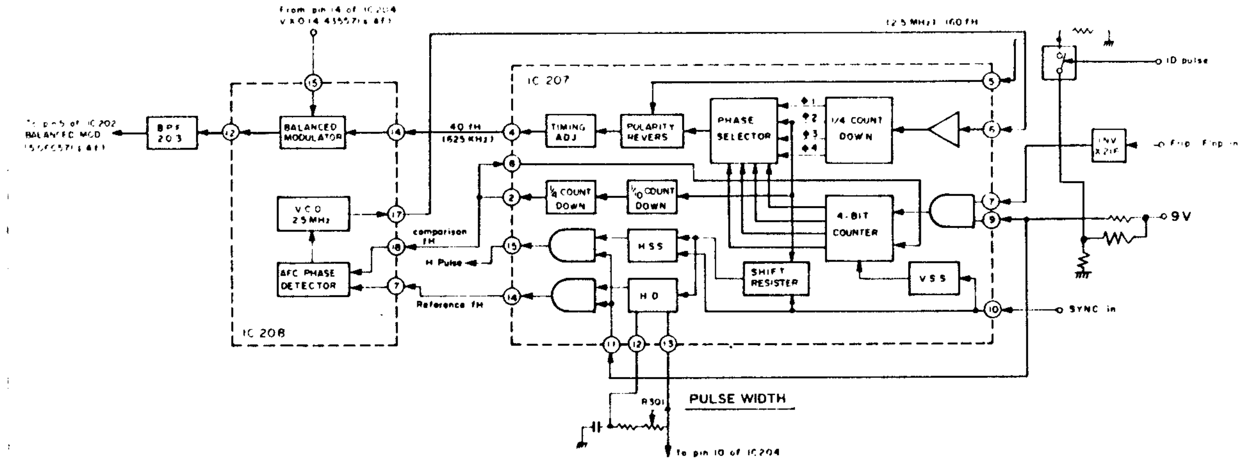

From pin 14 of IC204
VXO (4.435571±Δf)
(2.5 MHz) 160 fH
To pin 5 of IC202
BALANCED MOD
(5.060571±Δf)
BPF
203
BALANCED
MODULATOR
40 fH
(625 KHz)
IC 207
TIMING
ADJ
POLARITY
REVERS
PHASE
SELECTOR
φ1
φ2
φ3
φ4
1/4 COUNT
DOWN
ID pulse
INV
X2IF
Flip Flop in
1/4 COUNT
DOWN
1/10 COUNT
DOWN
4-BIT
COUNTER
9V
VCO
2.5 MHz
comparison
fH
H Pulse
HSS
SHIFT
RESISTER
VSS
AFC PHASE
DETECTOR
Reference fH
HD
SYNC in
IC 208
R301
PULSE WIDTH
To pin 10 of IC204

Fig. 3-32 Block diagram of AFC system

The AFC PHASE DETECTOR (IC208) detects the phase of the reference fH (Sync signal) and comparison fH to generate error voltage, which will be fed to VCO (Voltage Control Oscillator) for oscillating correct 160 fH (2.5 MHz) signal.

Namely, there is generated 160 fH which synchronizes perfectly to input fH.

This 160 fH signal is supplied to pin 6 of IC207, 1/4 COUNT DOWN and PHASE SELECTOR which is the most important part of AFC that generates 40 fH (625 kHz) signal and rotates it by 90° every 1-H at CH-2 and normal phase at CH-1.

The 40 fH (625 kHz) signal generated in the above manner is supplied to pin 14 of IC208 (BALANCED MODULATOR), where frequency conversion of the signal is made with 4.43 MHz element coming from V.X.O. After that, sum element of the signal (5.06 MHz) is picked up by BPF-203 and finally the element will be supplied to pin 5 of IC202 (BALANCED MODULATOR).

All the signals concerned to the IC are shown in Fig. 3-32. The AFC system operates in the same manner both in recording and playback. In explaining on the side of CH-1, the colour signal phase is normal every 1-H and the CH-2 colour signal phase delayed 90° every 1-H in recording, while in playback the original colour signal can be reproduced by advancing 90° every 1-H at CH-2.

1. ID pulse (Identification pulse)

In playback, however, there is a fear that the reference horizontal sync signal may be distorted owing to drop-out or switching point. For example, there might be a interference pulse supplied at a part of waveform.

In this case, this interference signal is detected with the comparison fH signal at the AFC phase detector and error voltage controls the VCO (Voltage Controlled Oscillator), so that the VCO oscillated the incorrect frequency.

Then the final output colour signal phase difference is more than 90° to the normal recorded colour phase. In such the case it cannot be compensated by APC system because it functions within 90° and it is hopeless to obtain normal playback colour signal.

Therefore, there arises the necessity of an ID pulse which controlls the AFC system to obtain the normal colour phase.

Namely, when there occurs advance or phase difference by more than ±90°, the phase detector-2 generates a low pulse. This pulse (ID pulse) supplied to pin 5 of IC207 POLARITY REVERSE to reverse the output colour signal phase. Then after timing runs back to the normal condition. Regarding the reason why ID pulse is generated when the phase difference is more than ±90°, refer to the subsection 3-2-7 (3) and (5).

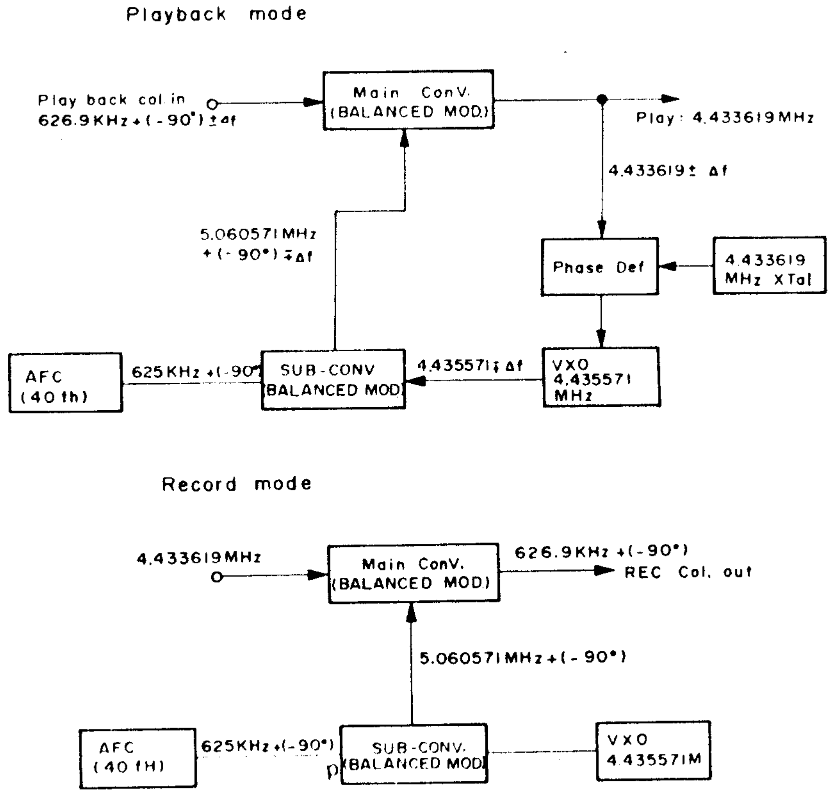

Playback mode
Play back col in
626.9KHz+(-90°)±Δf
Main ConV.
(BALANCED MOD)
Play: 4.433619MHz
4.433619±Δf
5.060571MHz
+(-90°)∓Δf
Phase Def
4.433619
MHz XTal
AFC
(40 fh)
625KHz+(-90°)
SUB-CONV
BALANCED MOD
4.435571±Δf
VXO
4.435571
MHz
Record mode
4.433619MHz
Main ConV.
(BALANCED MOD)
626.9KHz+(-90°)
REC Col. out
5.060571MHz+(-90°)
AFC
(40 fH)
625KHz+(-90°)
SUB-CONV.
(BALANCED MOD)
VXO
4.435571M

Fig. 3-33

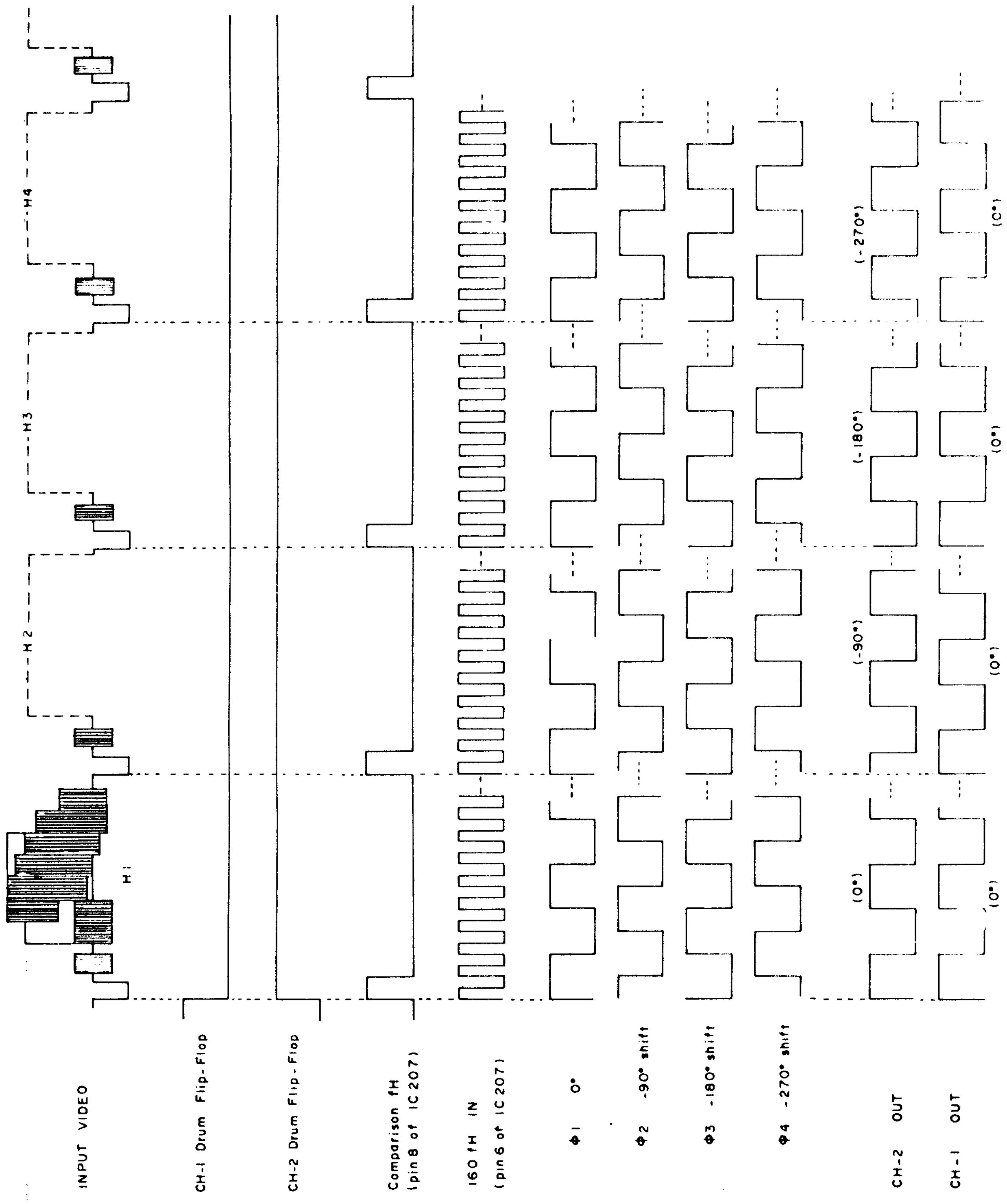


Fig. 3-34 Timing chart

2. Record colour killer

When the "VHS" is recording a black and white signal as input, there is no burst present in the signal. At this time the output of the record colour killer is a high positive voltage which is sent to the switchers. In other words, in black and white signal mode the switcher switches the filter to record FM signals in order to utilize the recording band of VHS system as effectively as possible.

The signal from ACC is first amplified by X210 and then supplied to the burst separator X211. The burst signal is picked up by X211 and detected by D210 and D211 so that DC voltage may be otained. The obtained DC voltage is supplied to the operational amplifier (comparator) IC206.

The DC potential at the pin 2 of IC206 is the threshold voltage for killer and it is adjusted by R283.

The output of IC206 is supplied to the electronic switch X212, whose collector is the output of Rec. colour killer and the output is high voltage (approx. 8V DC) as the black-and-white signal.

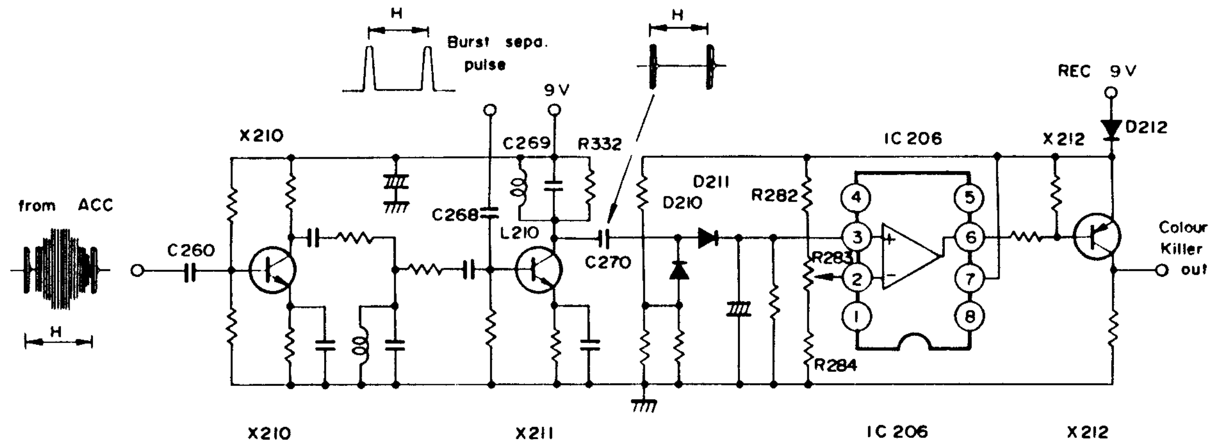

H
Burst sepa. pulse
9V
REC 9V
from ACC
C260
X210
C269
R332
C268
L210
C270
D211
D210
R282
R283
R284
IC206
X212
D212
Colour Killer out
X211

Fig. 3-35 Burst separator and comparator

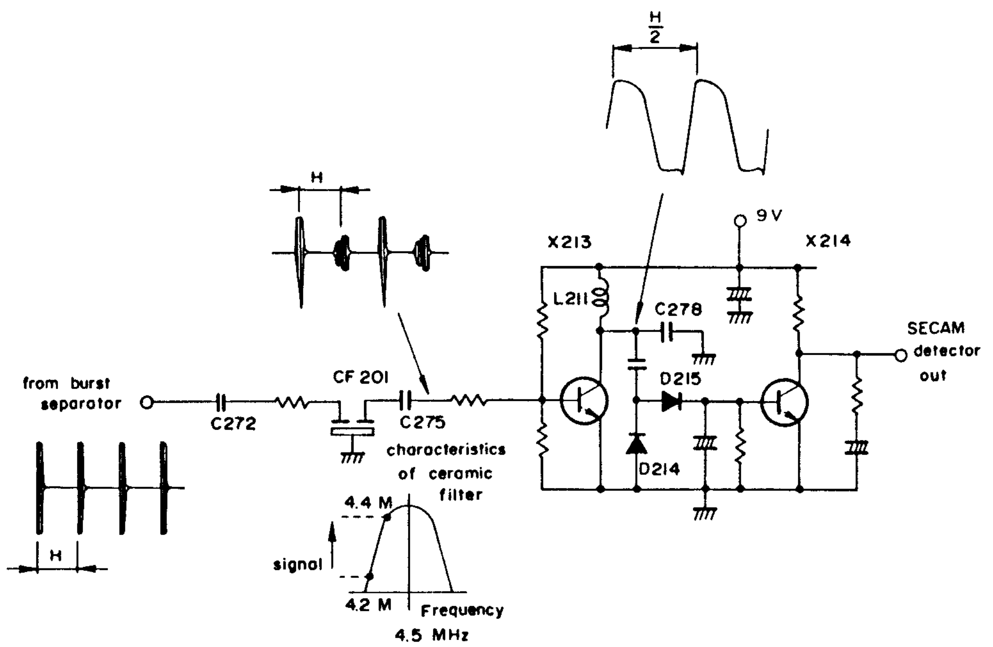
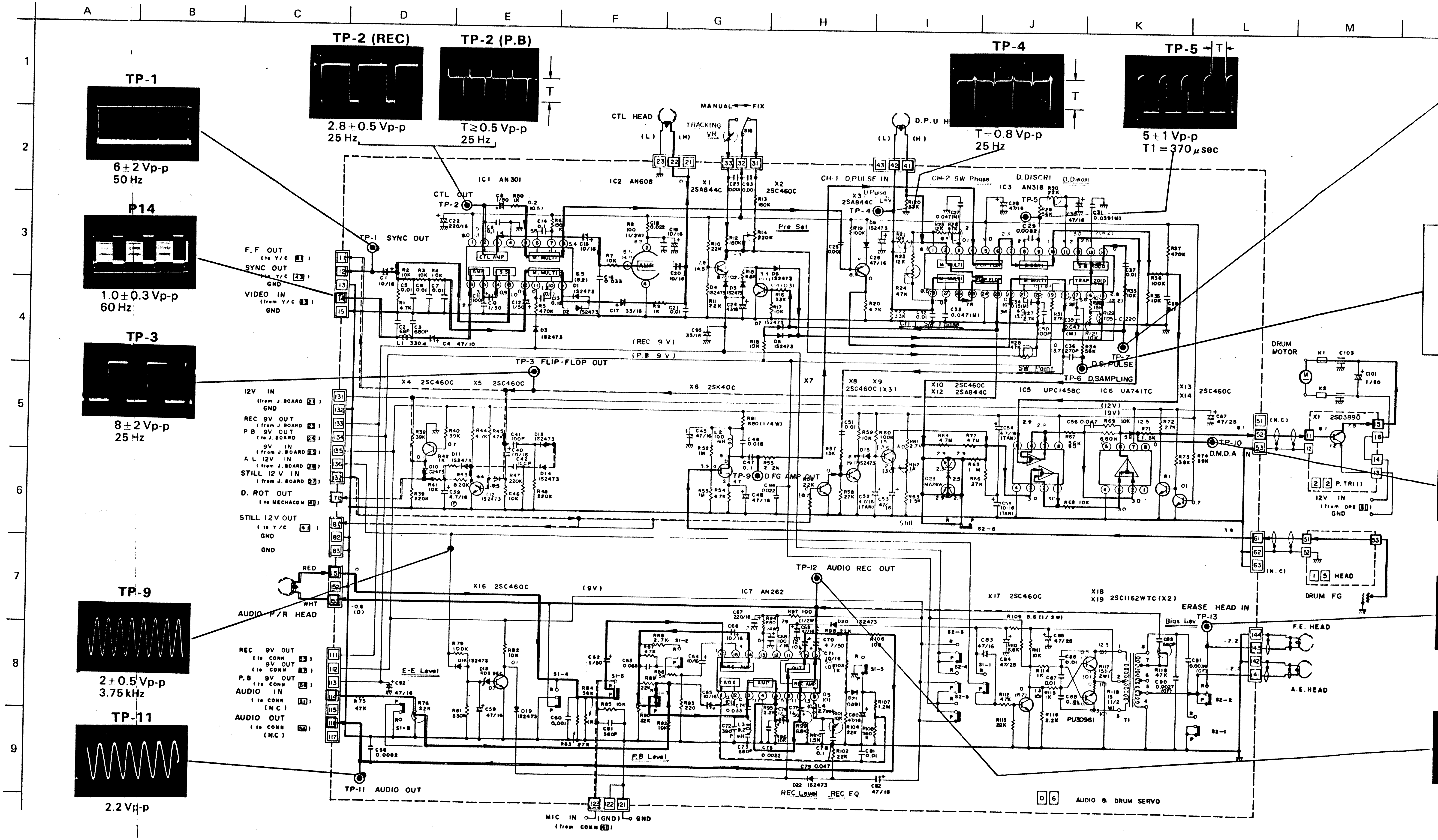
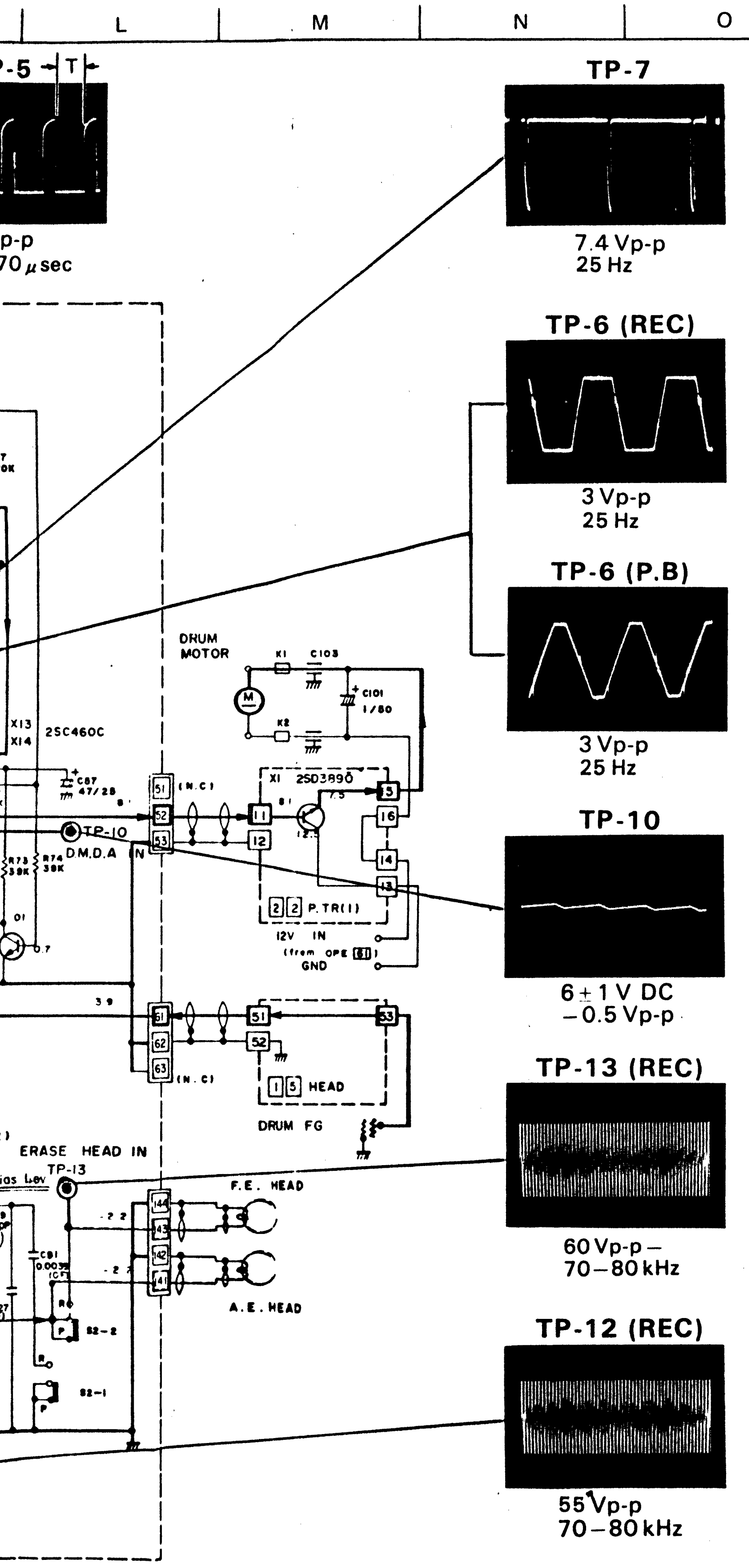

H/2
H
9V
X213
X214
L211
C278
D215
D214
SECAM detector out
from burst separator
C272
CF 201
C275
characteristics of ceramic filter
4.4 M
4.2 M
signal
Frequency
4.5 MHz

Fig. 3-36 SECAM detector

10-16 AUDIO AND DRUM SERVO SCHEMATIC DIAGRAM

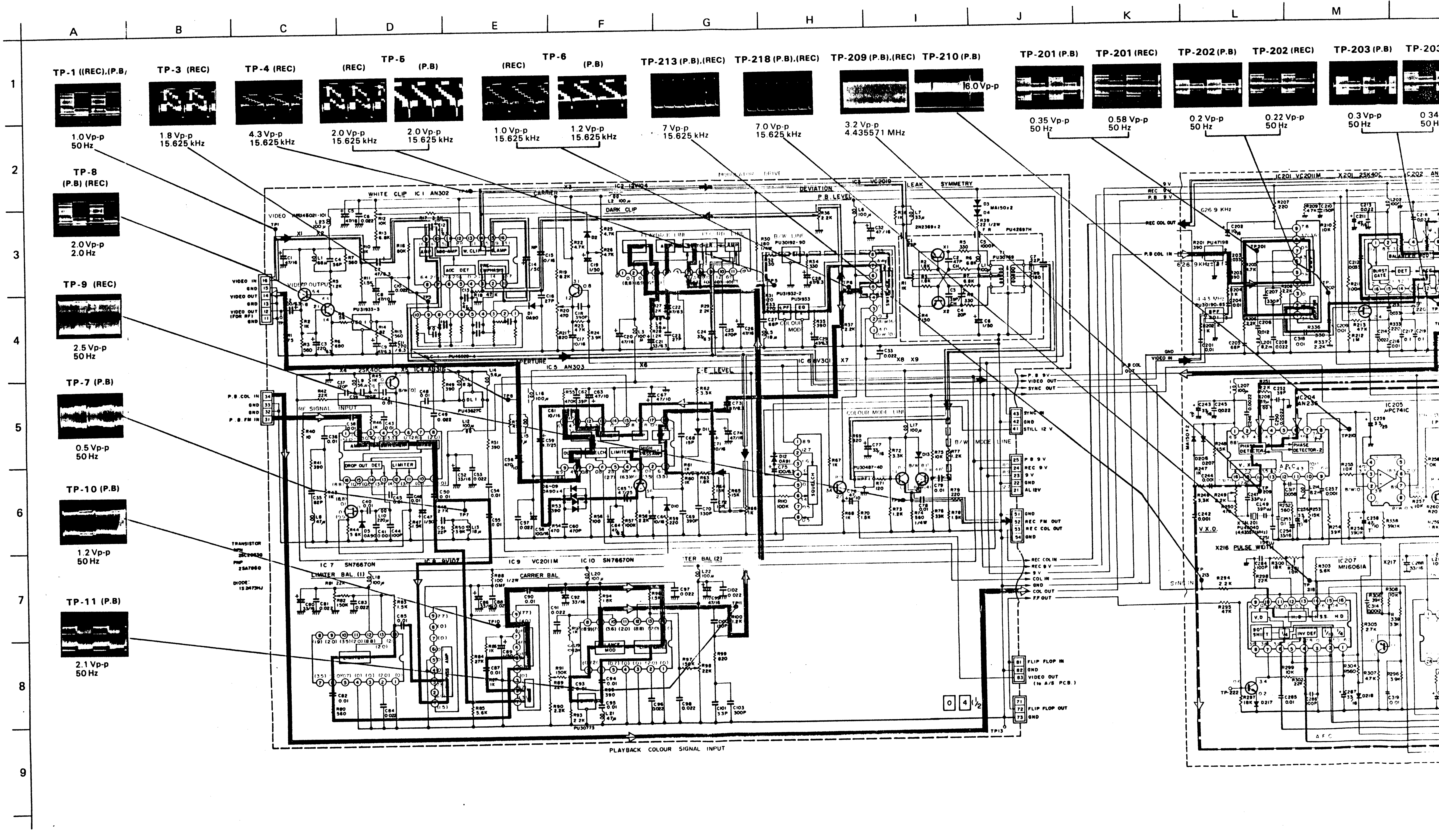

A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
7
8
9
TP-1
6±2 Vp-p
50 Hz
P14
1.0±0.3 Vp-p
60 Hz
TP-3
8±2 Vp-p
25 Hz
TP-9
2±0.5 Vp-p
3.75 kHz
TP-11
2.2 Vp-p
TP-2 (REC)
2.8+0.5 Vp-p
25 Hz
TP-2 (P.B)
T≥0.5 Vp-p
25 Hz
T
TP-4
T=0.8 Vp-p
25 Hz
TP-5
5±1 Vp-p
T1=370 μsec
CTL HEAD
MANUAL←→FIX
TRACKING VR
D.P.U HEAD
IC1 AN301
IC2 AN608
IC3 AN318
IC5 UPC1458C
IC6 UA741TC
IC7 AN262
CTL OUT
TP-2
TP-1 SYNC OUT
F.F OUT
SYNC OUT
VIDEO IN
GND
Pre Set
CH-1 D.PULSE IN
CH-2 SW Phase
D.DISCRI
TP-4
TP-5
TP-3 FLIP-FLOP OUT
TP-6 D.SAMPLING
TP-7 D.S.PULSE
SW Point
X4 2SC460C
X5 2SC460C
X6 2SK40C
X7
X8 X9 2SC460C (X3)
X10 2SC460C
X12 2SA844C
X13 X14 2SC460C
TP-9 D.FG AMP OUT
TP-10 D.M.D.A
Still
12V IN
REC 9V OUT
P.B 9V OUT
9V IN
A.L 12V IN
STILL 12 V IN
D. ROT OUT
STILL 12V OUT
DRUM MOTOR
X1 2SD389Q
P.TR(1)
12V IN
DRUM FG
HEAD
RED
WHT
AUDIO P/R HEAD
X16 2SC460C
TP-12 AUDIO REC OUT
X17 2SC460C
X18 X19 2SC1162WTC (X2)
ERASE HEAD IN
TP-13
Bias Lev
F.E. HEAD
A.E. HEAD
E-E Level
P.B Level
REC Level
REC EQ
REC 9V OUT
P.B 9V OUT
AUDIO IN
AUDIO OUT
TP-11 AUDIO OUT
MIC IN
GND
PU30961
AUDIO & DRUM SERVO


L
M
N
O
P
Q
R
S
TP-5
T
p-p
70 μsec
TP-7
7.4 Vp-p
25 Hz
TP-6 (REC)
3 Vp-p
25 Hz
TP-6 (P.B)
3 Vp-p
25 Hz
TP-10
6 ± 1 V DC
− 0.5 Vp-p
TP-13 (REC)
60 Vp-p –
70 – 80 kHz
TP-12 (REC)
55 Vp-p
70 – 80 kHz
DRUM MOTOR
M
K1
C103
C101
1/80
K2
X13
X14
2SC460C
C87
47/25
X1
2SD389Q
51
52
53
(N.C)
11
12
13
14
15
16
TP-10
DM.D.A
IN
R73
3.9K
R74
3.9K
Q1
2 2 P.TR(1)
12V IN
(from OPE 61)
GND
61
62
63
(N.C)
51
52
53
1 5 HEAD
DRUM FG
ERASE HEAD IN
TP-13
Bias Lev
144
143
142
141
F.E. HEAD
A.E. HEAD
C81
0.0033
S2-2
S2-1
P
R

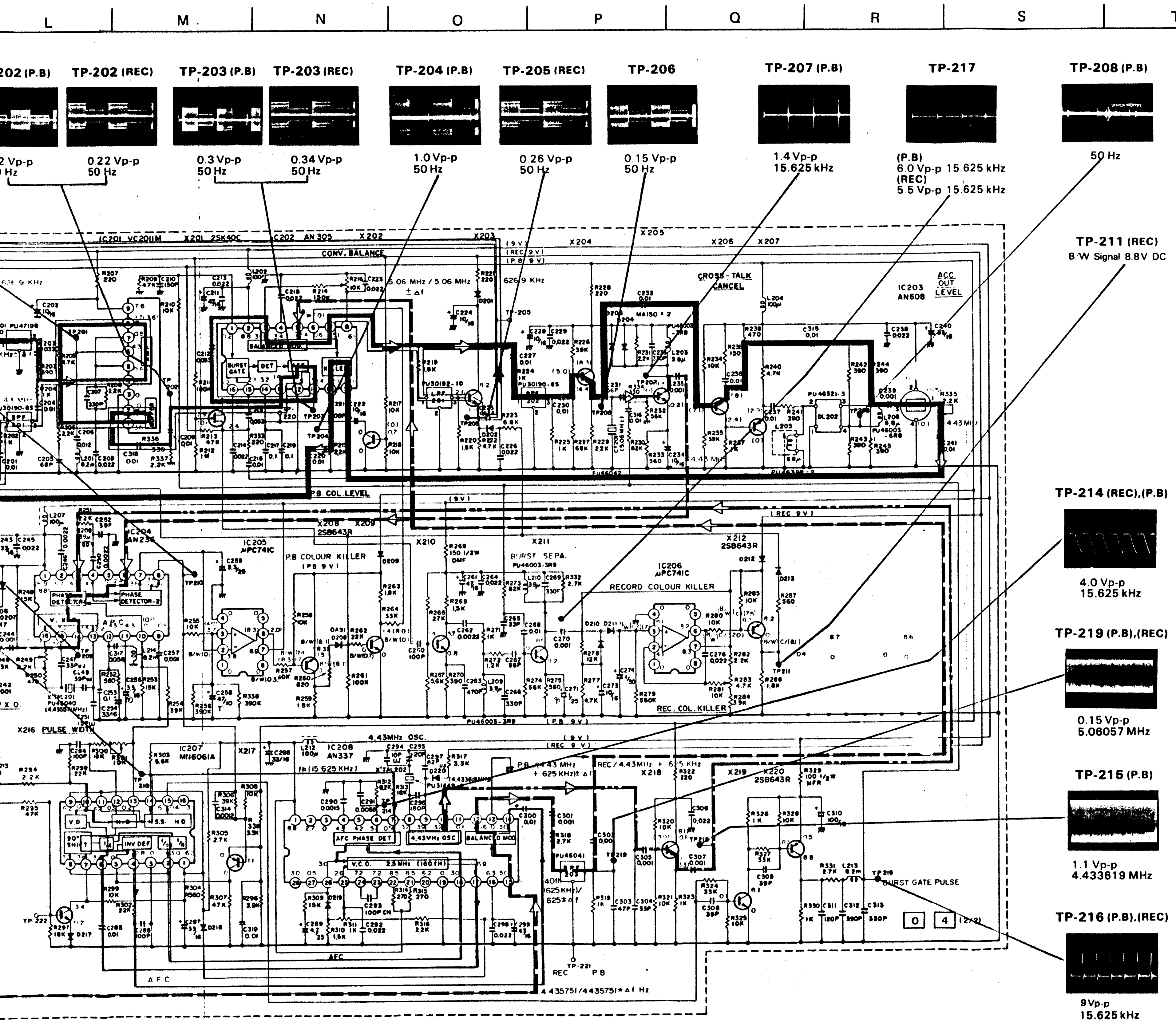
NOTE: 1. Unless otherwise specified;
All resistance values are in ohms, 1/8 W.
All capacitance values are μF.

2. All voltages are DC-measured with a V.T.V.M at record mode.
( ) represents the DC voltage at playback mode.
[ ] represents the DC voltage at still mode.

10-17 LUMINANCE (Y) AND COLOR SCHEMATIC DIAGRAM



A
B
C
D
E
F
G
H
I
J
K
L
M
1
2
3
4
5
6
7
8
9
TP-1 ((REC),(P.B)
1.0 Vp-p
50 Hz
TP-3 (REC)
1.8 Vp-p
15.625 kHz
TP-4 (REC)
4.3 Vp-p
15.625 kHz
TP-5
(REC)
2.0 Vp-p
15.625 kHz
(P.B)
2.0 Vp-p
15.625 kHz
TP-6
(REC)
1.0 Vp-p
15.625 kHz
(P.B)
1.2 Vp-p
15.625 kHz
TP-213 (P.B),(REC)
7 Vp-p
15.625 kHz
TP-218 (P.B),(REC)
7.0 Vp-p
15.625 kHz
TP-209 (P.B),(REC)
3.2 Vp-p
4.435571 MHz
TP-210 (P.B)
6.0 Vp-p
TP-201 (P.B)
0.35 Vp-p
50 Hz
TP-201 (REC)
0.58 Vp-p
50 Hz
TP-202 (P.B)
0.2 Vp-p
50 Hz
TP-202 (REC)
0.22 Vp-p
50 Hz
TP-203 (P.B)
0.3 Vp-p
50 Hz
TP-8
(P.B) (REC)
2.0 Vp-p
2.0 Hz
TP-9 (REC)
2.5 Vp-p
50 Hz
TP-7 (P.B)
0.5 Vp-p
50 Hz
TP-10 (P.B)
1.2 Vp-p
50 Hz
TP-11 (P.B)
2.1 Vp-p
50 Hz
WHITE CLIP IC 1 AN302
CARRIER
IC2 12V104
DARK CLIP
DEVIATION
P.B. LEVEL
IC3 VC2010
LEAK
SYMMETRY
VIDEO
VIDEO OUTPUT
VIDEO IN
GND
VIDEO OUT
GND
VIDEO OUT (FOR RF)
GND
AGC DET
W. CLIP
AMP
APERTURE
IC 5 AN303
X4 2SK40C
X5 IC4 AN316
E-E LEVEL
IC 6 MV301
RF SIGNAL INPUT
DROP OUT DET
LIMITER
P.B COL IN
GND
GND
P.B FM IN
COLOUR MODE LINE
B/W MODE LINE
SQUELCH
LIMITER
HIGH PASS
TRANSISTOR
DIODE
IC 7 SN76670N
IC 8 BV107
IC 9 VC2011M
IC 10 SN76670N
LIMITER BAL (1)
CARRIER BAL
TER BAL (2)
BALANCE MOD
P.B 9V
VIDEO OUT
SYNC OUT
SYNC IN
GND
STILL 12 V
P.B 9V
REC 9V
9V
GND
AL 12V
GND
REC FM OUT
REC COL OUT
GND
REC COL IN
REC 9V
9V
COL IN
GND
COL OUT
F.F OUT
FLIP FLOP IN
GND
VIDEO OUT (to A/B PCB)
FLIP FLOP OUT
GND
TP13
PLAYBACK COLOUR SIGNAL INPUT
04 1/2
IC201 VC2011M
X201 2SK40C
C202
REC 9V
P.B 9V
626.9 KHz
REC COL OUT
P.B COL IN
4.43 MHz
BPF
BALANCED MOD
BURST GATE
DET
GND
VIDEO IN
P.B COL OUT
IC204 AN236
PHASE DETECTOR-1
PHASE DETECTOR-2
IC205 µPC741C
V.X.O.
X216 PULSE WIDTH
IC207 MF16061A
SYNC IN
V.D
90° SHIFT
INV DEF
SS. MD
A.F.C


L
M
N
O
P
Q
R
S
T
U
V
W
X
202 (P.B)
2 Vp-p
Hz
TP-202 (REC)
0.22 Vp-p
50 Hz
TP-203 (P.B)
0.3 Vp-p
50 Hz
TP-203 (REC)
0.34 Vp-p
50 Hz
TP-204 (P.B)
1.0 Vp-p
50 Hz
TP-205 (REC)
0.26 Vp-p
50 Hz
TP-206
0.15 Vp-p
50 Hz
TP-207 (P.B)
1.4 Vp-p
15.625 kHz
TP-217
(P.B)
6.0 Vp-p 15.625 kHz
(REC)
5.5 Vp-p 15.625 kHz
TP-208 (P.B)
50 Hz
TP-211 (REC)
B/W Signal 8.8V DC
TP-214 (REC),(P.B)
4.0 Vp-p
15.625 kHz
TP-219 (P.B),(REC)
0.15 Vp-p
5.06057 MHz
TP-215 (P.B)
1.1 Vp-p
4.433619 MHz
TP-216 (P.B),(REC)
9 Vp-p
15.625 kHz
IC201 VC2011M
X201 2SK40C
IC202 AN305
X202
X203
CONV. BALANCE
5.06 MHz / 5.06 MHz ± Δf
626.9 KHz
X204
X205
X206
X207
CROSS-TALK CANCEL
IC203 AN608
ACC OUT LEVEL
4.43 MHz
PB COL. LEVEL
IC204 AN236
PHASE DETECTOR-2
IC205 μPC741C
PB COLOUR KILLER
X208 2SB643R
X209
X210
X211
BURST SEPA.
IC206 μPC741C
RECORD COLOUR KILLER
X212 2SB643R
REC. COL. KILLER
X.O.
X216
PULSE WIDTH
IC207 MN6061A
X217
IC208 AN337
4.43MHz OSC.
fh (15.625 KHz)
AFC PHASE DET
4.43MHz OSC
BALANCED MOD
V.C.O. 2.5 MHz (160 fH)
P.B (4.43 MHz + 625 KHz) ± Δf
REC / 4.43 MHz + 625 KHz
X218
X219
X220 2SB643R
BURST GATE PULSE
AFC
A F C
TP-221
REC
P B
4.435751/4.435751 ± Δf Hz
0
4
(2/2)

All reference numbers of components in colour circuit diagram are started from 201.

All voltages are DC measured with a VTVM.

( ) represents the DC voltage measured at playback mode.

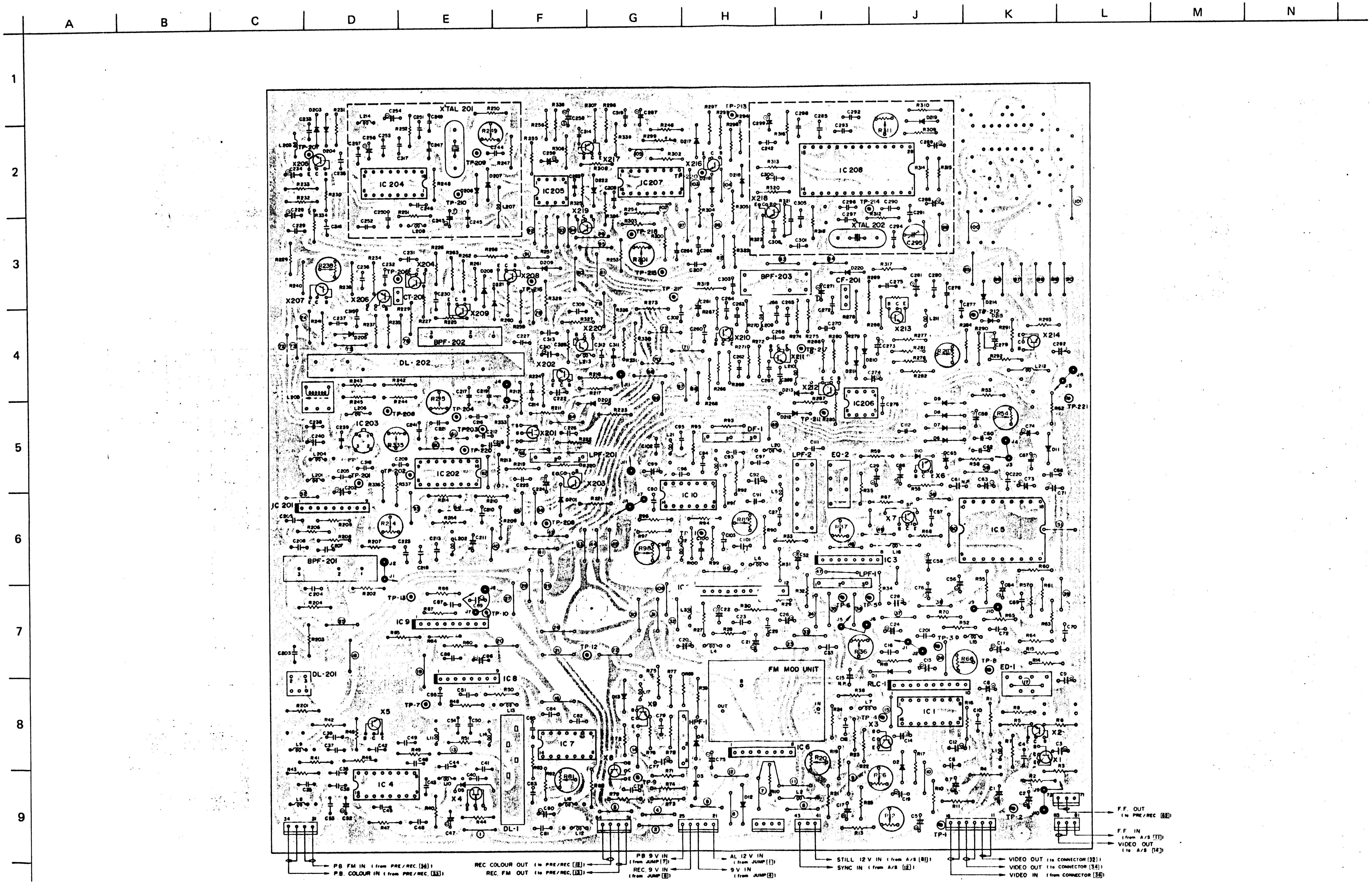
R332 is mounted on EK type only.

NOTE: Unless otherwise specified;
All PNP transistors are 2SA564Q.
All NPN transistors are 2SC829C.
All diodes are MA150LF
All resistance values are in ohms, 1/4 W, ±10%.
OMF : Oxide metal film resistor
: Electrolytic capacitor
: Non-polar electrolytic capacitor
: Mylar or ceramic capacitor

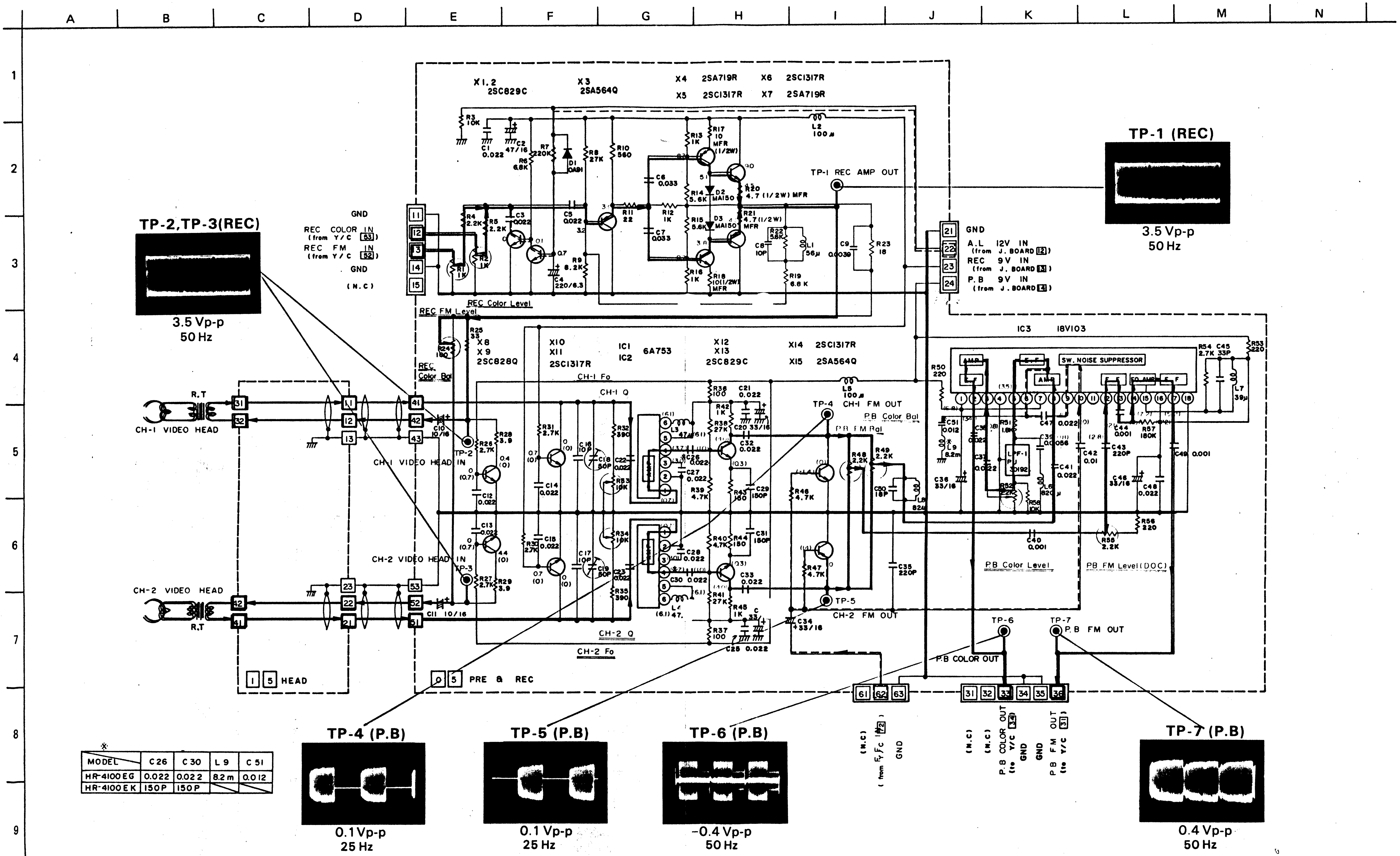
▬ : Playback mode signal path and APC signal path.

▭ : Record mode signal path.

10-18 LUMINANCE (Y) AND COLOR CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
PB FM IN (from PRE/REC [34])
P.B. COLOUR IN (from PRE/REC. [33])
REC COLOUR OUT (to PRE/REC [32])
REC. FM OUT (to PRE/REC. [31])
PB 9 V IN (from JUMP [7])
REC. 9 V IN (from JUMP [6])
AL 12 V IN (from JUMP [1])
9 V IN (from JUMP [4])
STILL 12 V IN (from A/S [8])
SYNC IN (from A/S [12])
VIDEO OUT (to CONNECTOR [32])
VIDEO OUT (to CONNECTOR [34])
VIDEO IN (from CONNECTOR [36])
F.F. OUT (to PRE/REC [62])
F.F. IN (from A/S [11])
VIDEO OUT (to A/S [14])
IC 201
IC 202
IC 203
IC 204
IC 205
IC 206
IC 207
IC 208
IC 1
IC 3
IC 4
IC 5
IC 6
IC 7
IC 8
IC 9
IC 10
XTAL 201
XTAL 202
BPF-201
BPF-202
BPF-203
DL-201
DL-202
DL-1
LPF-1
LPF-2
LPF-201
HPF-1
EQ-2
DF-1
CF-201
CT-201
ED-1
RLC-1
FM MOD UNIT
TP-1
TP-2
TP-12
TP-221

10-19 PRE AND RECORD SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
8
9
X1,2 2SC829C
X3 2SA564Q
X4 2SA719R
X5 2SC1317R
X6 2SC1317R
X7 2SA719R
R3 10K
C1 0.022
C2 47/16
R6 6.8K
R7 220K
D1 OA91
R8 27K
R10 560
R13 1K
R17 10 MFR (1/2W)
C6 0.033
R14 5.6K
D2 MA150
R20 4.7 (1/2W) MFR
L2 100µ
TP-1 REC AMP OUT
R4 2.2K
R5 2.2K
C3 0.022
C5 0.022
R11 22
R12 1K
C7 0.033
R15 5.6K
D3 MA150
R21 4.7(1/2W) MFR
R22 5.6K
C8 10P
L1 56µ
C9 0.0039
R23 18
R9 8.2K
C4 220/6.3
R16 1K
R18 10(1/2W) MFR
R19 6.8K
R1 1K
R2 1K
GND
REC COLOR IN (from Y/C 63)
REC FM IN (from Y/C 52)
GND
(N.C)
11
12
13
14
15
21
22
23
24
GND
A.L 12V IN (from J. BOARD 12)
REC 9V IN (from J. BOARD 13)
P.B 9V IN (from J. BOARD 14)
REC Color Level
REC FM Level
R25 33
R24 150
REC Color Bal
X8 X9 2SC828Q
X10 X11 2SC1317R
IC1 IC2 6A753
X12 X13 2SC829C
X14 2SC1317R
X15 2SA564Q
IC3 18V103
L5 100µ
TP-4 CH-1 FM OUT
P.B Color Bal
P.B FM Bal
CH-1 Fo
CH-1 Q
R.T
CH-1 VIDEO HEAD
31
32
11
12
13
41
42
43
C10 10/16
TP-2
R26 2.7K
R28 3.9
CH-1 VIDEO HEAD IN
C12 0.022
C13 0.022
R31 2.7K
C16 10P
C18 50P
C22 0.022
R32 390
R33 10K
C14 0.022
R36 100
C21 0.022
R42 1K
R38 27K
C20 33/16
C26
C32 0.022
C27 0.022
R39 4.7K
R43 150
C29 150P
R48 2.2K
R49 2.2K
C50 18P
L8
R46 4.7K
R50 220
C51 0.012
L9 8.2m
C36 33/16
R51 1.8K
C38 0.022
C37 0.022
LPF-1 PJ 3D192
C39 0.0056
R52 2.2K
R56 10K
L6 820µ
C47 0.022
C41 0.022
C42 0.01
C44 0.001
C43 220P
R57 180K
C46 33/16
C48 0.022
C49 0.001
R54 2.7K
C45 33P
R53 220
L7 39µ
AMP
E-F
AMP
SW. NOISE SUPPRESSOR
E-F
FM AMP
E-F
R55 2.2K
R56 220
C40 0.001
P.B Color Level
P.B FM Level(DOC)
CH-2 VIDEO HEAD
R.T
23
22
21
42
41
53
52
51
C11 10/16
TP-3
CH-2 VIDEO HEAD IN
R27 2.7K
R29 3.9
R30 2.7K
C15 0.022
C17 10P
C19 50P
C23 0.022
R34 10K
R35 390
R40 4.7K
R44 150
C31 150P
C28 0.022
C30 0.022
L4
R41 27K
C33 0.022
R45 1K
C35 220P
R47 4.7K
TP-5 CH-2 FM OUT
C34 33/16
R37 100
C25 0.022
CH-2 Q
CH-2 Fo
TP-6
TP-7 P.B FM OUT
P.B COLOR OUT
1 5 HEAD
0 5 PRE & REC
61
62
63
31
32
33
34
35
36
(N.C)
(from Y/C 62)
GND
(N.C)
(N.C)
P.B COLOR OUT (to Y/C 34)
GND
GND
P.B FM OUT (to Y/C 31)
TP-1 (REC)
3.5 Vp-p
50 Hz
TP-2, TP-3 (REC)
3.5 Vp-p
50 Hz
TP-4 (P.B)
0.1 Vp-p
25 Hz
TP-5 (P.B)
0.1 Vp-p
25 Hz
TP-6 (P.B)
-0.4 Vp-p
50 Hz
TP-7 (P.B)
0.4 Vp-p
50 Hz

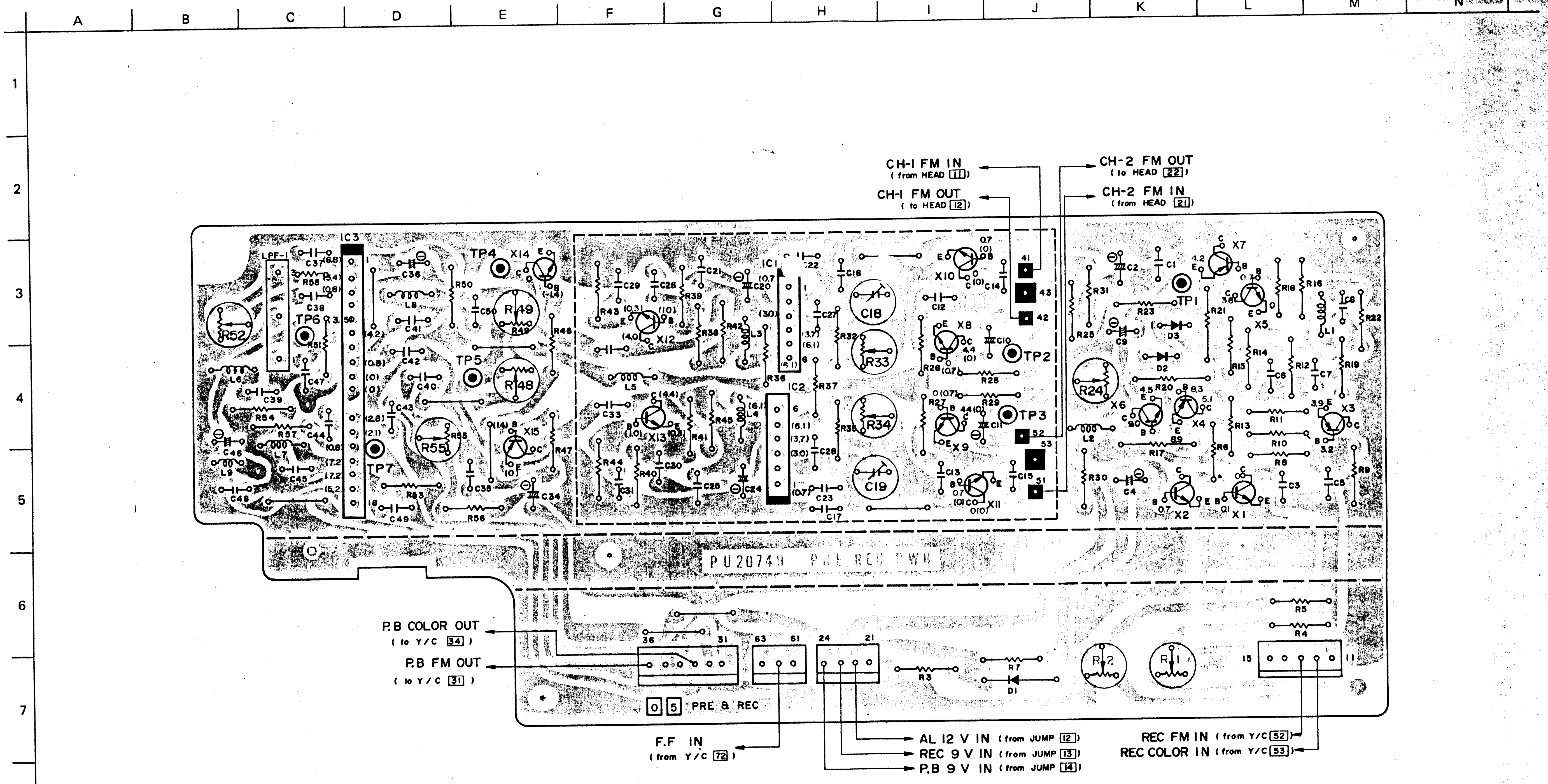
※

MODEL	C26	C30	L9	C51
HR-4100EG	0.022	0.022	8.2m	0.012
HR-4100EK	150P	150P		

NOTE: 1. Unless otherwise specified;
All resistance values are in ohms, 1/8 W.
All capacitance values are µF.

2. All voltages are DC-measured with a V.T.V.M at record mode.

10-20 PRE AND RECORD CIRCUIT BOARD


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
CH-1 FM IN (from HEAD 11)
CH-1 FM OUT (to HEAD 12)
CH-2 FM OUT (to HEAD 22)
CH-2 FM IN (from HEAD 21)
IC3
IC1
IC2
LPF-1
TP1
TP2
TP3
TP4
TP5
TP6
TP7
PU20749 PRE REC PWB
P.B COLOR OUT (to Y/C 34)
P.B FM OUT (to Y/C 31)
0 5 PRE & REC
F.F IN (from Y/C 72)
AL 12 V IN (from JUMP 12)
REC 9 V IN (from JUMP 13)
P.B 9 V IN (from JUMP 14)
REC FM IN (from Y/C 52)
REC COLOR IN (from Y/C 53)

NOTE: All voltages are DC-measured with a V.T.V.M at record mode.
( ) represents the DC voltage at playback mode.

SECTION 11

ELECTRICAL PARTS LIST

TABLE OF CONTENTS

1. CONNECTOR ASSY 191
2. CAPSTAN/POWER P.C BOARD ASSY 191
3. LUMINANCE/CHROMINANCE (Y/C) P.C BOARD ASSY 192
4. FM MOD UNIT ASSY 193
5. PRE/RECORD (PRE/REC) P.C BOARD ASSY 193
6. AUDIO/SERVO (A/S) P.C BOARD ASSY 194
7. JUMP P.C BOARD ASSY 194
8. MECHA CONTROL ASSY 194
9. OPERATION P.C BOARD ASSY 194
10. TAPE GUARD P.C BOARD ASSY 194
11. VIDEO HEAD P.C BOARD ASSY 195
12. AUDIO & CTL HEAD P.C BOARD ASSY 195
13. LED P.C BOARD ASSY 195
14. START SENSOR P.C BOARD ASSY 195
15. END SENSOR P.C BOARD ASSY 195
16. POWER TR P.C BOARD (1) ASSY 195
17. POWER TR P.C BOARD (2) ASSY 195
18. POWER TR P.C BOARD (3) ASSY 195

1. All abbreviations in this list are as follows:

RESISTORS – All resistance values are in ohms.

K : 1 000
M : 1 000 000
CR : Carbon Resistor
Comp. R : Composition Resistor
WR : Wire Wound Resistor
OMR : Oxide Metal Film Resistor
VR : Variable Resistor
MFR : Metal Film Resistor

CAPACITORS – All capacitance values are in μF, unless otherwise indicated.

P : μμF
C Cap : Ceramic Capacitor
PS Cap : Polystyrol Capacitor
MY Cap : Mylar Capacitor
MP Cap : Metalized Paper Capacitor
PC Cap : Polycarbonate Capacitor
E Cap : Electrolytic Capacitor
PP Cap : Poly Pro Capacitor
MM Cap : Metalized Mylar Capacitor
T Cap : Tantalum Capacitor
NP Cap : Non-Polar Capacitor

Tolerance of resistors and capacitors is as follows:

M : ±20%
K : ±10%
J : ± 5%
G : ± 2%

2. Carbon resistors in ohm, 1/2 W, 1/4 W, 1/8 W, ±10% are not listed.
3. Standard electrolytic capacitors (less than 1 000μF), mylar capacitors (less than 100V) and ceramic capacitors (less than 50V) are not listed.

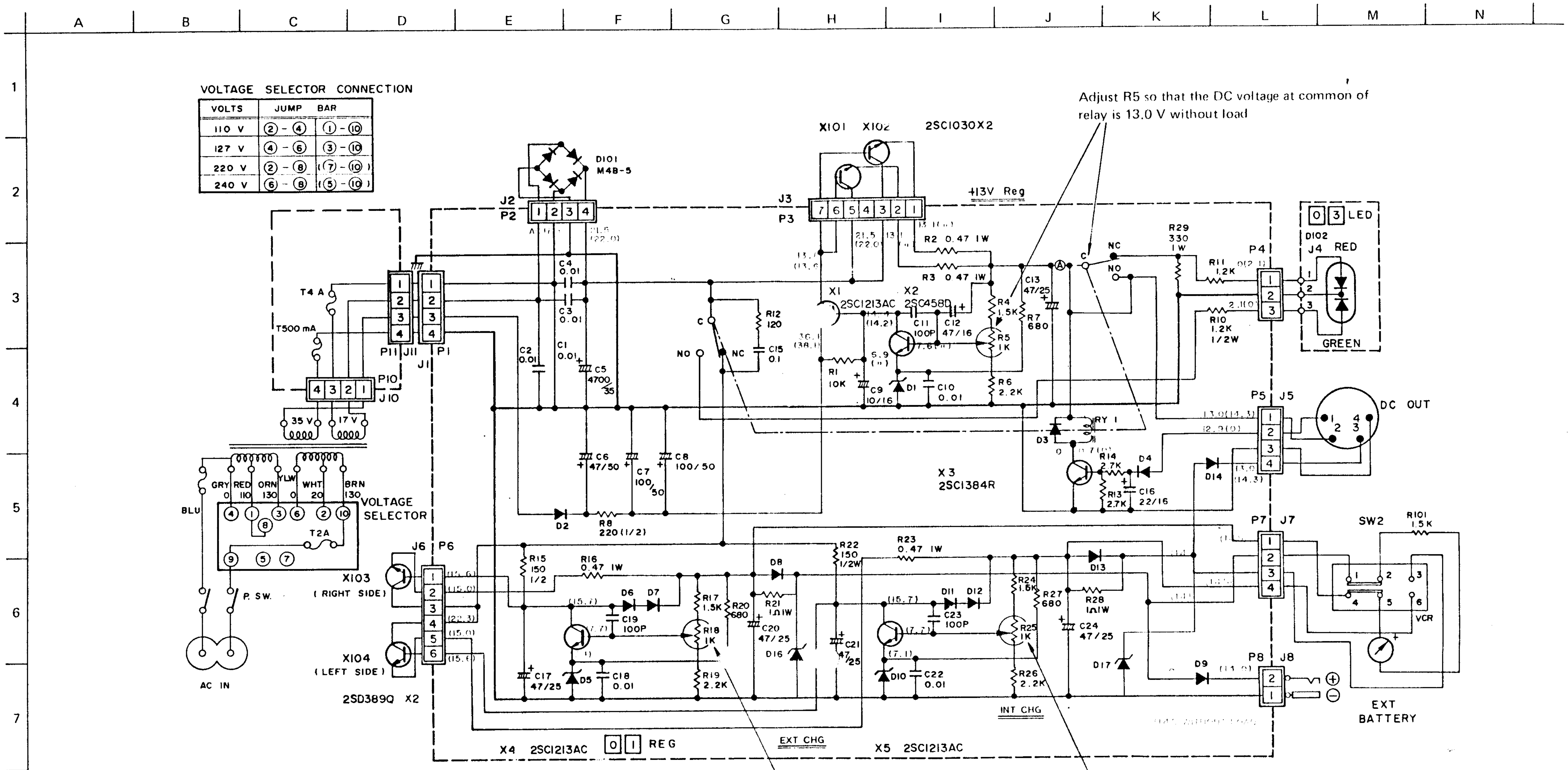
1. CONNECTOR ASSY

Symbol No.	Parts No.	Description	Schematic No.
1-1	BJ702952	Connector Assy VP-7100EG	PU47302C
1-2	BJ702953	Connector Assy VP-7100EK	PU47302B
1-IC1	EI740977	IC VC2019 VS-9300	VC2019
1-IC2	EI702954	IC VC2021 VP-7100	VC2021
1-X1,2	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
1-X3	ET741585	Transistor 2SA786Q VS-9500	2SA786Q
1-X4,5	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
1-D1,2	ED740729	Diode MA150 VS-9300	MA150
1-D3	ED740998	Diode OA91 VS-9300	OA91
1-C3	EC702955	Tantalum/C. VP-7100	QEE41VM 474
1-C4,5	EC741379	Tantalum/C. VS-9300	QEE41EM 105
1-C6	EC702956	Tantalum/C. VP-7100	QEE41CM 226
1-C7,8	EC703611	Tantalum/C. VS-9300	QEE81AM 476
1-C9	EC702956	Tantalum/C. VP-7100	QEE41CM 226
1-C10	EC702763	Tantalum/C. VS-9500	QEE41CM 106
1-CONN A	EJ702957	BNC Connector VP-7100 (Video IN)	PU47377-3
1-CONN B	EJ702957	BNC Connector VP-7100 (Video OUT)	PU47377 3
1-CONN C	BJ702958	Jack Assy VP-7100 (Audio IN)	QMS3501 010
1-CONN D	BJ702958	Jack Assy VP-7100 (Audio OUT)	QMS3501-010
1-CONN E	BJ702959	Jack Assy VP-7100 (Mic IN)	QMS3503 003
1-CONN G	BJ702958	Jack Assy VP-7100 (Remo. Con.)	QMS3501 010
1-CONN H	EJ740963	Aerial Connector VS-9300EG (RF OUT)	PU46471
1-CONN H	EJ702960	Aerial Connector VP-7100EK (RF OUT)	A75937
1-CONN I	EJ702961	4P DIN Connector VP-7100 (DC IN)	QMC9016 002
1-CONN J	EJ702962	10P Connector VP-7100 (Camera)	GU45801
1-CONN K	EJ702853	Jack Assy VA-7100 (Battery)	QMA1221 001
1-3	BJ702963	Jack Assy VP-7100	QMC0131 002
1-4	EJ741045	Cap Housing VS-9300	PU43351 3
1-5	EJ741067	Cap Housing VS-9300	PU43351 5
1-6	EJ741047	Cap Housing VS-9300	PU43351 6
1-7	EJ741048	Cap Housing VS-9300	PU43351 7
1-8	EF703620	Fuse VP-7100	QMF51A2 5R0
1-9	SP702964	Connector Panel VP-7100	PU47281

2. CAPSTAN/POWER P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
2-1	BA702965	Capstan/Power P.C Board Assy VP-7100	PU46181B
2-IC1	EI741072	IC μPC1458C VS-9300	UPC1458C
2-IC2	EI702966	IC μPD4069C VP-7100	UPD4069C
2-IC3	EI702967	IC MSM4020 VP-7100	MSM4020
2-IC4	EI741570	IC μPD4011C VS-9500	UPD4011C
2-IC5	EI741072	IC μPC1458C VS-9300	UPC1458C
2-IC6	EI702968	IC HA17723G VP-7100	HA17723G
2-IC7	EI741072	IC μPC1458C VS-9300	UPC1458C
2-X1	ET740990	FET 2SK40C VS-9300	2SK40C
2-X2to7	ET740989	Transistor 2SC829C VS-9300	2SC829C
2-X8,9	ET702969	Transistor 2SA564P VP-7100	2SA564P
2-X10	ET702970	Transistor 2SC1213C VP-7100	2SC1213C
2-X11	ET741171	Transistor 2SA673C VS-9300	2SA673C
2-X12,13	ET702970	Transistor 2SC1213C VP-7100	2SC1213C
2-D1,2	ED740998	Diode OA91 VS-9300	OA91
2-D5	ED740997	Diode MA150LF VS-9300	MA150LF
2-D8to10	ED740997	Diode MA150LF VS-9300	MA150LF
2-D11	ED741079	Zener Diode RD3.9EC VS-9300	RD3.9EC
2-D12,13	ED740997	Diode MA150LF VS-9300	MA150LF
2-D14,15	ED740998	Diode OA91 VS-9300	OA91
2-D16	ED702971	Zener Diode RD13EB VP-7100	RD13EB
2-D17	ED740997	Diode MA150LF VS-9300	MA150LF
2-D18,19	ED740742	Diode VO3C VS-9300	V03C
2-D20,21	ED740997	Diode MA150LF VS-9300	MA150LF
2-D22	ED740998	Diode OA91 VS-9300	OA91
2-R3	ER703211	Composition/R. VC-7100	QRD142K 106
2-R19	EV702972	Vol. VP-7100	QVZ3501 223
2-R50	ER702973	Non-Inflammable/R. VP-7100	QRF021K R47
2-R53	EV741001	Vol. VS-9300	QVP4A0B 472
2-R56	EV741002	Vol. VS-9300	QVP4A0B 222
2-R59	EV741002	Vol. VS-9300	QVP4A0B 222
2-C2	EC741084	Tantalum/C. VS-9300	QEE41CM 155
2-C24	EC741007	NP/C. VS-9300	QEN41CM 106
2-L1	EO702974	Choke Coil VP-7100	PU44041 104
2-L2,3	EO702975	Peaking Coil VP-7100	A04096 220
2-L4	EO702976	Peaking Coil VP-7100	A04096 2200
2-2	EI702977	X'TAL 3.58MHz VP-7100	PU30832 1M
2-3	EJ741045	Cap Housing VS-9300	PU43351 3
2-4	EJ741046	Cap Housing VS-9300	PU43351 4

1-8 AC POWER ADAPTOR SCHEMATIC DIAGRAM


A
B
C
D
E
F
G
H
I
J
K
L
M
N
1
2
3
4
5
6
7
VOLTAGE SELECTOR CONNECTION
D101
M4B-5
J2
P2
J3
P3
X101 X102 2SC1030X2
+13V Reg
R2 0.47 1W
R3 0.47 1W
X1 2SC1213AC
X2 2SC458D
C11 100P
C12 47/16
R4 1.5K
R5 1K
R6 2.2K
R7 680
C13 47/25
R1 10K
C9 10/16
D1
C10 0.01
R29 330 1W
R11 1.2K
R10 1.2K 1/2W
P4
J4
D102
LED
RED
GREEN
P5 J5
DC OUT
RY 1
D3
X3 2SC1384R
R14 2.7K
R13 2.7K
C16 22/16
D4
D14
C
NC
NO
R12 120
C15 0.1
T4A
T500mA
P11 J11
P1 J1
P10 J10
35 V
17 V
C4 0.01
C3 0.01
C2 0.01
C1 0.01
C5 4700/35
C6 47/50
C7 100/50
C8 100/50
D2
R8 220(1/2)
GRY RED ORN YLW WHT BRN
0 110 130 0 20 130
BLU
VOLTAGE SELECTOR
T2A
P. SW.
AC IN
J6 P6
X103 (RIGHT SIDE)
X104 (LEFT SIDE)
2SD389Q X2
R15 150 1/2
R16 0.47 1W
D6 D7
C19 100P
R17 1.5K
R18 1K
R19 2.2K
R20 680
R21 1Ω1W
D8
C20 47/25
D16
R22 150 1/2W
C21 47/25
C17 47/25
D5
C18 0.01
R23 0.47 1W
D11 D12
C23 100P
R24 1.6K
R25 1K
R26 2.2K
R27 680
R28 1Ω1W
C24 47/25
D13
D17
D10
C22 0.01
D9
P7 J7
P8 J8
SW2
R101 1.5K
VCR
EXT BATTERY
INT CHG
EXT CHG
X4 2SC1213AC
01 REG
X5 2SC1213AC

VOLTAGE SELECTOR CONNECTION

VOLTS	JUMP	BAR
110 V	②-④	①-⑩
127 V	④-⑥	③-⑩
220 V	②-⑧	(⑦-⑩)
240 V	⑥-⑧	(⑤-⑩)

Adjust R5 so that the DC voltage at common of relay is 13.0 V without load

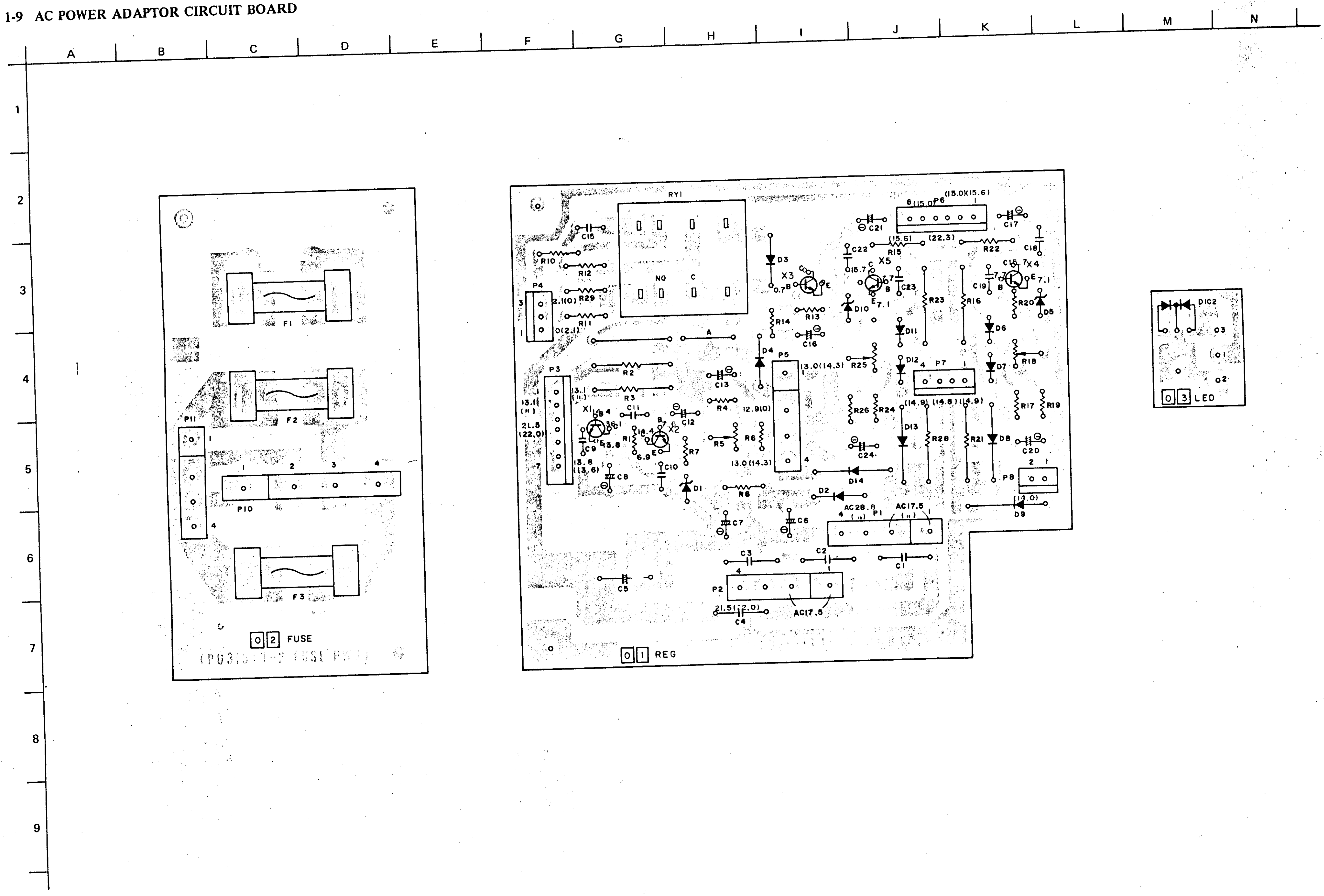
Adjust R18 so that the DC voltage of connector (p8-2) is 14.5 V without load

Adjust R25 so that the DC moltage of commector (p5-4) is 14.5 V without load

NOTE) UNLESS OTHERWITH SPECIFIED

1. DIODE
   - D1, 5, 10, RD6.8EC
   - D2, 3, 4 WO3C
   - D6, 7, 11, 12 1S2473VE
   - D8, 9, 13, 14, U05E
2. RESISTORS ARE IN OHMS 1/4W.
3. CAPACITERS ARE IN MICROFARADS
4. MARKED BY [ ] ARE LOCATED ON THE P.W.B

1-9 AC POWER ADAPTOR CIRCUIT BOARD


A
B
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1
2
3
4
5
6
7
8
9
F1
F2
F3
P11
P10
1
2
3
4
02 FUSE
(PU3151-2 FUSE PWB)
RY1
NO
C
C15
R10
R12
R29
R11
P4
2.1(0)
0(2.1)
A
P3
R2
R3
13.1
21.5
(22.0)
13.8
(13.6)
X1
X2
C9
C11
C12
R1
6.9
13.8
14.4
C8
C10
R7
D1
R4
R5
R6
R8
12.9(0)
13.0(14.3)
C13
D2
D3
D4
P5
C7
C6
C3
C2
C1
C5
C4
21.5(22.0)
P2
AC17.5
AC28.8
AC17.5
P1
X3
0.7
R13
R14
C16
D10
D11
D12
D13
D14
C21
C22
R15
(15.6)
(22.3)
X5
15.7
7.1
C23
R23
R25
R26
R24
C24
R28
P6
6 (15.0)
(15.0)(15.6)
C17
R22
C18
X4
C19
7.7
R16
R20
D5
D6
D7
D8
D9
R18
P7
(14.9)
(14.8)
(14.9)
R17
R19
R21
C20
P8
(14.0)
01 REG
DIC2
03 LED

2. POWER

Symbol No.
2-1
2-X1
2-X2
2-X3
2-X4,5
2-D1
2-D2to4
2-D5
2-D6,7
2-D8,9
2-D10
2-D11,12
2-D13,14
2-D16,17
2-R1,2
2-R5
2-R15
2-R16
2-R18
2-R21
2-R22
2-R23
2-R25
2-R28
2-R29
2-C25
2-RY-1
2-2
2-3
2-4
2-5
2-6

3. FU

Symbol No.
3-F2
3-F3

4. LI

Symbol No.
4-D10

3. LUMINANCE/CHROMINANCE (Y/C) P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
3-1	BA702978	Luminance/Chrominance (Y/C) P.C Board Assy VP-7100EG	PU47178C
3-2	BA702979	Luminance/Chrominance (Y/C) P.C Board Assy VP-7100EK	PU47178D
3-IC1	EI740975	IC AN302 VS-9300	AN302
3-IC2	EI740976	IC 12V104 VS-9300	12V104
3-IC3	EI740977	IC VC2019 VS-9300	VC2019
3-IC4	EI740978	IC AN316 VS-9300	AN316
3-IC5	EI740979	IC AN303 VS-9300	AN303
3-IC6	EI740980	IC 8V301 VS-9300	8V301
3-IC7	EI740981	IC SN76670N VS-9300	SN76670N
3-IC8	EI741568	IC 9V107 VS-9500	9V107
3-IC9	EI740982	IC VC2011M VS-9300	VC2011M
3-IC10	EI740981	IC SN76670N VS-9300	SN76670N
3-IC201	EI740982	IC VC2011M VS-9300	VC2011M
3-IC202	EI740983	IC AN305 VS-9300	AN305
3-IC203	EI740984	IC AN608 VS-9300	AN608
3-IC204	EI740985	IC AN236 VS-9300	AN236
3-IC205,206	EI740986	IC µPC741C VS-9300	UPC741C
3-IC207	EI740987	IC MN6061A VS-9300	MN6061A
3-IC208	EI740988	IC AN337 VS-9300	AN337
3-X1to3	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X4	ET740990	FET 2SK40C VS-9300	2SK40C
3-X5to9	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X201	ET740990	FET 2SK40C VS-9300	2SK40C
3-X202to205	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X206,207	ET741585	Transistor 2SA786Q VS-9500	2SA786Q
3-X208	ET741586	Transistor 2SB643R VS-9500	2SB643R
3-X209to211	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X212	ET741586	Transistor 2SB643R VS-9500	2SB643R
3-X213	ET741584	Transistor 2SC2063Q VS-9500EG	2SC2063Q
3-X214	ET741589	Transistor 2SD639S VS-9500EG	2SD639S
3-X216	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X217	ET741587	Transistor 2SD786Q VS-9500	2SD786Q
3-X218,219	ET741584	Transistor 2SC2063Q VS-9500	2SC2063Q
3-X220	ET741586	Transistor 2SB643R VS-9500	2SB643R
3-D1	ED740996	Diode OA90 VS-9300	OA90
3-D2	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D3,4	ED740729	Diode MA150 VS-9300	MA150
3-D5to9	ED740996	Diode OA90 VS-9300	OA90
3-D10,11	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D12	ED740998	Diode OA91 VS-9300	OA91
3-D13	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D201,202	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D203,204	ED740729	Diode MA150 VS-9300	MA150
3-D205	ED741591	Diode 1S2473HJ VS-9500EG	1S2473HJ
3-D206,207	ED740729	Diode MA150 VS-9300	MA150
3-D208	ED740998	Diode OA91 VS-9300	OA91
3-D209to213	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D214	ED741591	Diode 1S2473HJ VS-9500EG	1S2473HJ
3-D215	ED740909	Diode MA26T-A VS-9300EG	MA26T A
3-D216	ED741591	Diode 1S2473HJ VS-9500EG	1S2473HJ
3-D217to220	ED741591	Diode 1S2473HJ VS-9500	1S2473HJ
3-D221,222	ED741591	Diode 1S2473HJ VS-9500EG	1S2473HJ
3-R12	EV740999	Vol. VS-9300	QVP4A0B 103
3-R20	EV741000	Vol. VS-9300	QVP4A0B 471
3-R26	EV741001	Vol. VS-9300	QVP4A0B 472
3-R36,37	EV741002	Vol. VS-9300	QVP4A0B 222
3-R39	ER741512	Fuse/R. VS-9300	QRZ0047 220
3-R54	EV741000	Vol. VS-9300	QVP4A0B 471
3-R66	EV741005	Vol. VS-9300	QVP4A0B 102
3-R81	EV741004	Vol. VS-9300	QVP4A0B 223
3-R88	ER741006	OMF/R. VS-9300	QRG126J 101
3-R89	EV741004	Vol. VS-9300	QVP4A0B 223
3-R98	EV741004	Vol. VS-9300	QVP4A0B 223
3-R215	EV741002	Vol. VS-9300	QVP4A0B 222
3-R216	EV740999	Vol. VS-9300	QVP4A0B 103
3-R238	EV741000	Vol. VS-9300	QVP4A0B 471
3-R249	EV741002	Vol. VS-9300	QVP4A0B 222
3-R268	ER702752	OMF/R. VS-9500	QRG126J 151
3-R283	EV741001	Vol. VS-9300	QVP4A0B 472
3-R301	EV740999	Vol. VS-9300	QVP4A0B 103
3-R311	EV741005	Vol. VS-9300	QVP4A0B 102
3-R329	ER741006	OMF/R. VS-9300	QRG126J 101
3-R335	EV741002	Vol. VS-9300	QVP4A0B 222
3-C15	EC741007	NP/C. VS-9300	QEN41CM 106
3-C61	EC741007	NP/C. VS-9300	QEN41CM 106
3-C243	EC703610	Tantalum/C. VS-9500	QEE81CM 336
3-C256	EC702980	Tantalum/C. VP-7100	QEE41EM 335
3-C258	EC703611	Tantalum/C. VS-9500	QEE81AM 476
3-C271	EC741379	Tantalum/C. VS-9300	QEE41EM 105
3-C295	EC702761	Trimmer/C. VS-9500	QAT3001 008
3-L1	EO741207	Peaking Coil VS-9300	A04725 68
3-L2	EO702777	Peaking Coil VS-9500	PU46021 101
3-L3	EO741015	Peaking Coil VS-9300	A04725 100
3-L4	EO741016	Peaking Coil VS-9300	A04725 56
3-L5	EO741017	Peaking Coil VS-9300	A04725 18
3-L6	EO741015	Peaking Coil VS-9300	A04725 100
3-L7	EO741018	Peaking Coil VS-9300	A04725 33
3-L8	EO741025	Peaking Coil VS-9300	A04725 47
3-L9	EO741016	Peaking Coil VS-9300	A04725 56
3-L10	EO741019	Peaking Coil VS-9300	A04725 220
3-L11	EO741020	Peaking Coil VS-9300	A04725 8.2
3-L12	EO741015	Peaking Coil VS-9300	A04725 100
3-L13	EO741017	Peaking Coil VS-9300	A04725 18
3-L14	EO741021	Peaking Coil VS-9300	A04725 5.6
3-L15	EO741022	Peaking Coil VS-9300	A04725 1
3-L16	EO702777	Peaking Coil VS-9500	PU46021 101
3-L17,18	EO741015	Peaking Coil VS-9300	A04725 100
3-L19	EO741024	Peaking Coil VS-9300	A04725 1200
3-L20	EO741015	Peaking Coil VS-9300	A04725 100
3-L21	EO741025	Peaking Coil VS-9300	A04725 47
3-L22	EO741015	Peaking Coil VS-9300	A04725 100
3-L23	EO702777	Peaking Coil VS-9500	PU46021 101
3-L201	EO741522	Peaking Coil VS-9300	PU47051 822
3-L202	EO741015	Peaking Coil VS-9300	A04725 100
3-L203	EO741027	Peaking Coil VS-9300	PU46003 3R9
3-L204	EO741015	Peaking Coil VS-9300	A04725 100
3-L205	EO702778	Coil VS-9500	PU46398 2
3-L206	EO741029	Peaking Coil VS-9300	PU46003 6R8
3-L207	EO702777	Peaking Coil VS-9500	PU46021 101
3-L208	EO741030	Peaking Coil VS-9300	A04725 39
3-L209,210	EO741027	Peaking Coil VS-9300	PU46003 3R9
3-L211	EO741522	Peaking Coil VS-9300	PU47051 822
3-L212	EO702777	Peaking Coil VS-9500	PU46021 101
3-L213,214	EO741522	Peaking Coil VS-9300	PU47051 822
3-RLC1	EI702981	RLC Block VP-7100	PU46020 4
3-LPF1	ER741031	Low Pass Filter VS-9300	PU30192 9D
3-LPF2	ER702779	Low Pass Filter VS-9500	PU31932 2
3-LPF201	ER741033	Low Pass Filter VS-9300	PU30192 1D
3-BPF201,202	ER741034	Band Pass Filter VS-9300	PU30190 6S
3-BPF203	ER741035	Band Pass Filter VS-9300	PU46041
3-HPF1	ER741036	High Pass Filter VS-9300	PU30487 4D
3-DL1	EI741038	1-H Delay Line VS-9300	PU43627C
3-DL201	EI702982	Delay EQ VP-7100	PU47198
3-DL202	EI741523	2-H Delay Line VS-9300	PU46321 3
3-DF1	ER741037	DF1 VS-9300	PU30773
3-EQ1	EI702780	EQ VS-9500EG	PU31933 3
3-EQ2	EI702781	EQ VS-9500	PU31933
3-CF201	ER741524	Ceramic/C. VS-9300EG	PU46521
3-CT201	ER741041	Ceramic Trap VS-9300	PU46042
3-X'TAL201	EI741043	X'TAL 4.435571 MHz VS-9300	PU46040
3-X'TAL202	EI741044	X'TAL 4.433619 MHz VS-9300	PU31449 2
3-3	EJ741045	Cap Housing VS-9300	PU43351 3
3-4	EJ702782	Cap Housing VS-9500	PU4351 3Y
3-5	EJ741046	Cap Housing VS-9300	PU43351 4
3-6	EJ741067	Cap Housing VS-9300	PU43351 5
3-7	EJ741047	Cap Housing VS-9300	PU43351 6
3-8	BA741581	FM Mod Unit Assy VS-9500	PU42697H

4. FM MOD UNIT ASSY

Symbol No.	Parts No.	Description	Schematic No.
4-1	BA741581	FM Mod Unit Assy VS-9500	PU42697H
4-X1,2	ET741050	Transistor 2N2369 VS-9300	2N2369
4-T1	BT741051	FM Modulator Trans. VS-9300	PU30769
4-R1	EV741005	Vol. VS-9300	QVP4A0B 102
4-C1	EC741052	Feed Through/C. VS-9300	PU30767 220
4-C4	EC741055	Trimmer/C. VS-9300	QAT3001 015
4-C5	EC741056	Feed Through/C. VS-9300	PU30767 102
4-C7	EC741052	Feed Through/C. VS-9300	PU30767 220

5. PRE/RECORD (PRE/REC) P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
5-1	BA702983	Pre/Record (PRE/REC) P.C Board Assy VP-7100EG	PU46016H
5-2	BA702984	Pre/Record (PRE/REC) P.C Board Assy VP-7100EK	PU46016I
5-IC1,2	EI741059	IC 6A753 VS-9300	6A753
5-IC3	EI741060	IC 18V103 VS-9300	18V103
5-X1,2	ET740989	Transistor 2SC829C VS-9300	2SC829C
5-X3	ET740993	Transistor 2SA564Q VS-9300	2SA564Q
5-X4	ET740994	Transistor 2SA719R VS-9300	2SA719R
5-X5,6	ET741061	Transistor 2SC1317R VS-9300	2SC1317R
5-X7	ET740994	Transistor 2SA719R VS-9300	2SA719R
5-X8.9	ET741061	Transistor 2SC1317R VS-9300	2SC1317R
5-X10,11	ET741182	Transistor 2SC828Q VS-9300	2SC828Q
5-X12,13	ET740989	Transistor 2SC829C VS-9300	2SC829C
5-X14	ET741061	Transistor 2SC1317R VS-9300	2SC1317R
5-X15	ET740993	Transistor 2SA564Q VS-9300	2SA564Q
5-D1	ED740998	Diode OA91 VS-9300	OA91
5-D2,3	ED740997	Diode MA150LF VS-9300	MA150LF
5-R1,2	EV741005	Vol. VS-9300	QVP4A0B 102
5-R17	ER741063	MF/R. VS-9300	QRX126J 100
5-R24	EV741065	Vol. VS-9300	QVP4A0B 101
5-R33,34	EV740999	Vol. VS-9300	QVP4A0B 103
5-R48,49	EV741002	Vol. VS-9300	QVP4A0B 222
5-R52	EV741002	Vol. VS-9300	QVP4A0B 222
5-R55	EV741002	Vol. VS-9300	QVP4A0B 222
5-C10,11	EC702763	Tantalum/C. VS-9500	QEE41CM 106
5-C18,19	EC741062	Trimmer/C. VS-9300	QAT3001 009
5-L1	EO741016	Peaking Coil VS-9300	A04725 56
5-L2	EO741015	Peaking Coil VS-9300	A04725 100
5-L3,4	EO741025	Peaking Coil VS-9300	A04725 47
5-L5	EO741015	Peaking Coil VS-9300	A04725 100
5-L6	EO741066	Peaking Coil VS-9300	A04725 820
5-L7	EO741030	Peaking Coil VS-9300	A04725 39
5-L8	EO741528	Peaking Coil VS-9300	A04725 82
5-L9	EO741026	Peaking Coil VS-9300EG	A04096 8200
5-LPF1	ER741033	Low Pass Filter VS-9300	PU30192 1D
5-4	EJ741045	Cap Housing VS-9300	PU43351 3
5-5	EJ741046	Cap Housing VS-9300	PU43351 4
5-6	EJ741067	Cap Housing VS-9300	PU43351 5
5-7	EJ741047	Cap Housing VS-9300	PU43351 6

6. AUDIO/SERVO (A/S) P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
6-1	BA702985	Audio/Servo (A/S) P.C Board Assy VP-7100	PU46178B
6-IC1	EI741069	IC AN301 (AN301A) VS-9300	AN301
6-IC2	EI740984	IC AN608 VS-9300	AN608
6-IC3	EI741070	IC AN318 VS-9300	AN318
6-IC5	EI741072	IC μPC1458C VS-9300	UPC1458C
6-IC6	EI702986	IC μA741TC VP-7100	UA741TC
6-IC7	EI741073	IC AN262 VS-9300	AN262
6-X1	ET702987	Transistor 2SA844C VP-7100	2SA844C
6-X2	ET702988	Transistor 2SC460C VP-7100	2SC460C
6-X3	ET702987	Transistor 2SA844C VP-7100	2SA844C
6-X4,5	ET702988	Transistor 2SC460C VP-7100	2SC460C
6-X6	ET740990	FET 2SK40C VS-9300	2SK40C
6-X7to10	ET702988	Transistor 2SC460C VP-7100	2SC460C
6-X12	ET702987	Transistor 2SA844C VP-7100	2SA844C
6-X13,14	ET702988	Transistor 2SC460C VP-7100	2SC460C
6-X16,17	ET702988	Transistor 2SC460C VP-7100	2SC460C
6-X18,19	ET741077	Transistor 2SC1162WTC VS-9300	2SC1162WTC
6-D1to12	ED741175	Diode 1S2473 VS-9300	1S2473
6-D15,16	ED741175	Diode 1S2473 VS-9300	1S2473
6-D18	ED741079	Zener Diode RD3.9EC VS-9300	RD3.9EC
6-D19to22	ED741175	Diode 1S2473 VS-9300	1S2473
6-D23	ED702989	Diode MA26W VP-7100	MA26W
6-R8	ER702990	OMF/R. VP-7100	QRG126J 101M
6-R14	EV741094	Vol. VS-9300	QVP4A0B-224
6-R21	EV740999	Vol. VS-9300	QVP4A0B-103
6-R24	EV741093	Vol. VS-9300	QVP4A0B 473
6-R26	EV741093	Vol. VS-9300	QVP4A0B 473
6-R28	EV741093	Vol. VS-9300	QVP4A0B 473
6-R30	EV702972	Vol. VP-7100	QVZ3501-223
6-R62	EV702991	Vol. VP-7100	QVZ3501-102
6-R76	EV741004	Vol. VS-9300	QVP4A0B 223
6-R90	EV741004	Vol. VS-9300	QVP4A0B 223
6-R97	ER702990	OMF/R. VP-7100	QRG126J 101M
6-R99	EV741529	Vol. VS-9300	QVP4A0B-682
6-R101	EV740999	Vol. VS-9300	QVP4A0B-103
6-R109	ER702992	MF/R. VP-7100	QRX126J 5R6M
6-R117,118	ER702993	OMF/R. VP-7100	QRG126J 150M
6-R119	EV741376	Vol. VS-9300	QVZ3501-473
6-R122	ED741095	Thermistor TD5 C220 VS-9300	TD5 C220
6-C39	EC702765	Tantalum/C. VS-9500	QEE41CM-475
6-C52	EC702765	Tantalum/C. VS-9500	QEE41CM-475
6-C54	EC702765	Tantalum/C. VS-9500	QEE41CM-475
6-C55	EC702763	Tantalum/C. VS-9500	QEE41CM-106
6-C90	EC741090	PP/C. VS-9300	QFP32XK-272
6-C91	EC741091	PP/C. VS-9300	QFP32XK-392
6-L1	EO741103	Peaking Coil VS-9300	A04725-330
6-L2	EO702974	Choke Coil VP-7100	PU44041-104
6-L3	EO741104	Coil VS-9300	PU30771-5
6-L4	EO741532	Peaking Coil VS-9300	A04725 2700
6-T1	BT741102	OSC Trans. VS-9300	PU30961
6-S1	ES741530	Slide SW. (S1) VS-9300	PU47001
6-S2	ES741531	Slide SW. (S2) VS-9300	PU47002
6-2	EJ741045	Cap Housing VS-9300	PU43351-3
6-3	EJ741046	Cap Housing VS-9300	PU43351-4
6-4	EJ741067	Cap Housing VS-9300	PU43351-5
6-5	EJ741048	Cap Housing VS-9300	PU43351-7

7. JUMP P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
7-1	EJ741046	Cap Housing VS-9300	PU43351 4
7-D1to3	ED740729	Diode MA150 VS-9300	MA150

8. MECHA CONTROL ASSY

Symbol No.	Parts No.	Description	Schematic No.
8-1	BA702995	Mecha Control Assy VP-7100	PU47087A
8-IC1	EI741110	IC MSM4011 VS-9300	MSM4011
8-IC2	EI741112	IC CD4023UBE VS-9300	CD4023UBE
8-IC3	EI702986	IC μA741TC VP-7100	UA741TC
8-X1	ET740989	Transistor 2SC829C VS-9300	2SC829C
8-X2	ET702970	Transistor 2SC1213C VP-7100	2SC1213C
8-X3	ET741077	Transistor 2SC1162WTC VS-9300	2SC1162WTC
8-X4,5	ET740989	Transistor 2SC829C VS-9300	2SC829C
8-X6	ET702970	Transistor 2SC1213C VP-7100	2SC1213C
8-X7	ET740933	Transistor 2SD3890 VS-9300	2SD3890
8-X8	ET740989	Transistor 2SC829C VS-9300	2SC829C
8-D1,2	ED740729	Diode MA150 VS-9300	MA150
8-D3	ED740998	Diode OA91 VS-9300	OA91
8-D4to8	ED740729	Diode MA150 VS-9300	MA150
8-D9,10	ED740998	Diode OA91 VS-9300	OA91
8-D12	ED740742	Diode VO3C VS-9300	V03C
8-D13	ED740729	Diode MA150 VS-9300	MA150
8-D14	ED702996	Zener Diode RD12EB VP-7100	RD12EB
8-D15to17	ED740729	Diode MA150 VS-9300	MA150
8-D18	ED740998	Diode OA91 VS-9300	OA91
8-D19	ED740729	Diode MA150 VS-9300	MA150
8-R2	ER741189	OMF/R. VS-9300	QRG016J 101
8-C1,2	EC702763	Tantalum/C. VS-9500	QEE41CM 106
8-2	EJ741045	Cap Housing VS-9300	PU43351 3
8-3	EJ741047	Cap Housing VS-9300	PU43351 6

9. OPERATION P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
9-S1	ES740821	Micro SW. VS-9300	QSM1S01-014
9-S2	ES702895	Micro SW. VP-7100	QSM1S01 010
9-S3to5	ES740821	Micro SW. VS-9300	QSM1S01 014
9-1	EJ702782	Cap Housing VS-9500	PU4351-3Y
9-2	EJ741045	Cap Housing VS-9300	PU43351-3

10. TAPE GUARD P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
10-X1	ET741224	Photo Transistor PN202S VS-9300	PN202S
10-D1	ED703000	LED 5082-4694 VP-7100	5082 4694

11. VIDEO HEAD P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
11-X1,2	ET703003	Transistor 2SC2021Q VP-7100	2SC2021Q
11-D1	ED741175	Diode 1S2473 VS-9300	1S2473

12. AUDIO & CTL HEAD P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
12-1	HR741419	Audio/Control Head Assy VS-9300	PU46435M

13. LED P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
13-D1	ED703004	LED 5082-4657 VP-7100	5082-4657
13-D2	ED703215	LED 5082-4557 VP-7100	5082-4557
13-1	EJ741107	Cap Housing VS-9300	PU43351-103

14. START SENSOR P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
14-X1	ET741224	Photo Transistor PN202S VS-9300	PN202S

15. END SENSOR P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
15-X1	ET741224	Photo Transistor PN202S VS-9300	PN202S

16. POWER TR P.C BOARD (1) ASSY

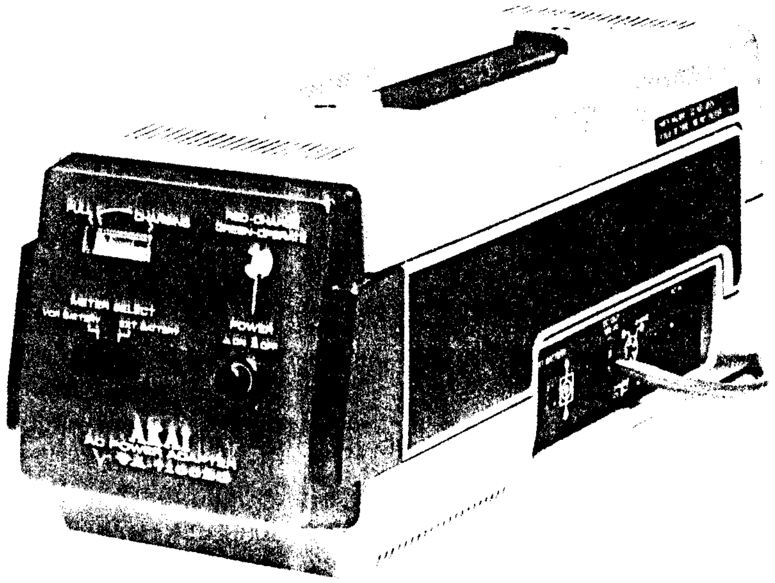
Symbol No.	Parts No.	Description	Schematic No.
16-X1	ET740933	Transistor 2SD3890 VS-9300	2SD3890

17. POWER TR P.C BOARD (2) ASSY

Symbol No.	Parts No.	Description	Schematic No.
17-X1	ET740933	Transistor 2SD3890 VS-9300	2SD3890

18. POWER TR P.C BOARD (3) ASSY

Symbol No.	Parts No.	Description	Schematic No.
18-X1	ET703005	Transistor 2SD723 VP-7100	2SD723



AC POWER ADAPTER

MODEL VA-7100EG/EK

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2. POWER SUPPLY P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
2-1	BA702868	Power Supply P.C Board Assy VA-7100	PU46354C
2-X1	ET702869	Transistor 2SC1213AD VA-7100	2SC1213AC
2-X2	ET702870	Transistor 2SC458D VA-7100	2SC458D
2-X3	ET702871	Transistor 2SC1384R VA-7100	2SC1384R
2-X4,5	ET702869	Transistor 2SC1213AD VA-7100	2SC1213AC
2-D1	ED741184	Zener Diode RD6.8EC VS-9300	RD6.8EC
2-D2to4	ED740742	Diode VO3C'VS-9300	V03C
2-D5	ED741184	Zener Diode RD6.8EC VS-9300	RD6.8EC
2-D6,7	ED741592	Diode 1S2473VE VS-9500	1S2473VE
2-D8,9	ED702872	Diode U05E VA-7100	U05E
2-D10	ED741184	Zener Diode RD6.8EC VS-9300	RD6.8EC
2-D11,12	ED741592	Diode 1S2473VE VS-9500	1S2473VE
2-D13,14	ED702872	Diode U05E VA-7100	U05E
2-D16,17	ED703487	Diode HZ15-3 VA-7100	HZ15-3
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2-R5	EV741005	Vol. VS-9300	QVP4A0B-102
2-R15	ER702874	MF/R. VA-7100	QRX126J-151
2-R16	ER702873	MF/R. VA-7100	QRX019J-R47S
2-R18	EV702875	Vol. VA-7100	QVZ3505-102
2-R21	ER702876	MF/R. VA-7100	QRX019J-1R0S
2-R22	ER702874	MF/R. VA-7100	QRX126J-151
2-R23	ER702873	MF/R. VA-7100	QRX019J-R47S
2-R25	EV741005	Vol. VS-9300	QVP4A0B-102
2-R28	ER702876	MF/R. VA-7100	QRX019J-1R0S
2-R29	ER703488	OMF/R. VA-7100	QRG016J-331
2-C25	EC702878	MM/C. VA-7100	QFH52AM-474
2-RY-1	EP702879	Relay VA-7100	PU44335
2-2	EJ702880	Cap Housing VA-7100	PU43351-2
2-3	EJ741045	Cap Housing VS-9300	PU43351-3
2-4	EJ741046	Cap Housing VS-9300	PU43351-4
2-5	EJ741047	Cap Housing VS-9300	PU43351-6
2-6	EJ741048	Cap Housing VS-9300	PU43351-7

3. FUSE P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
3-F2	EF702882	Fuse VA-7100	QMF51A2 4R0 BS
3-F3	EF702883	Fuse VA-7100	QMF-51A2-R50-BS

4. LED P.C BOARD ASSY

Symbol No.	Parts No.	Description	Schematic No.
4-D102	ED702885	LED VA-7100	PU46267T